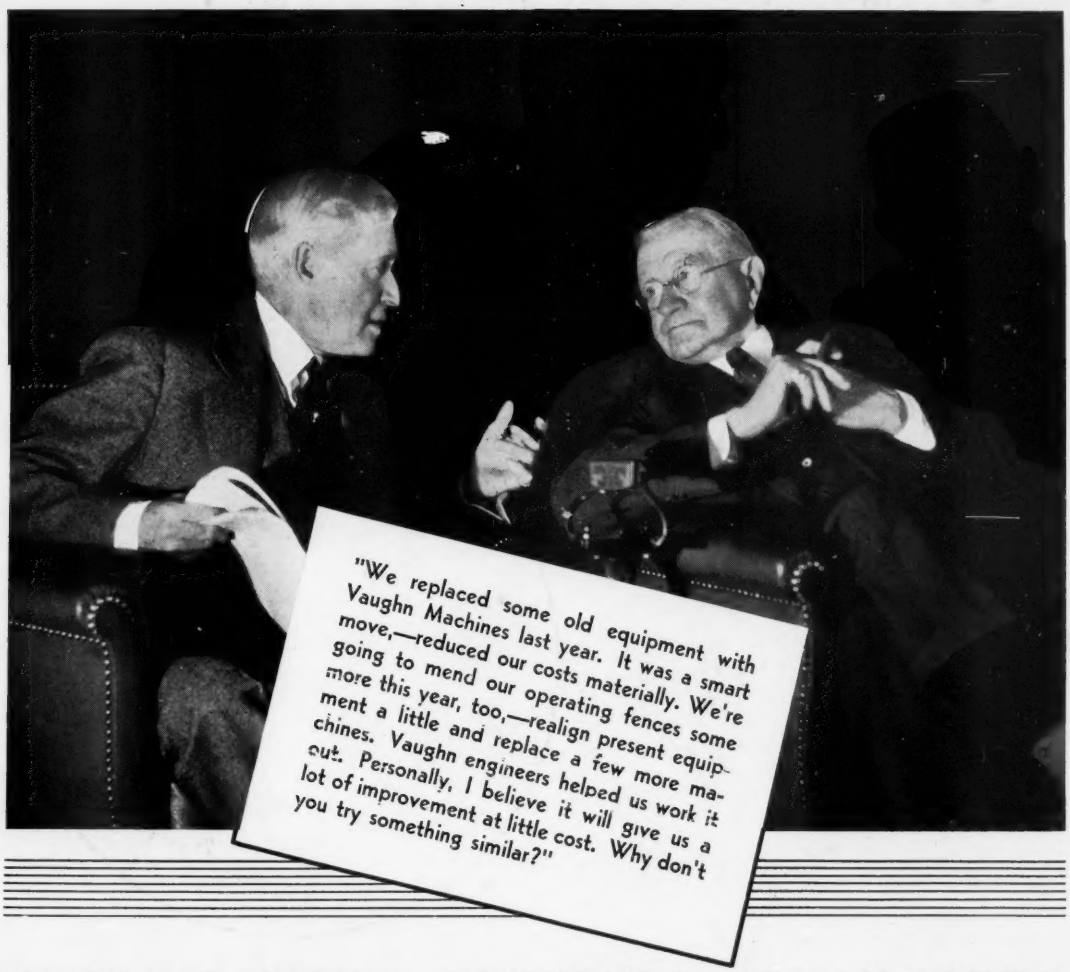
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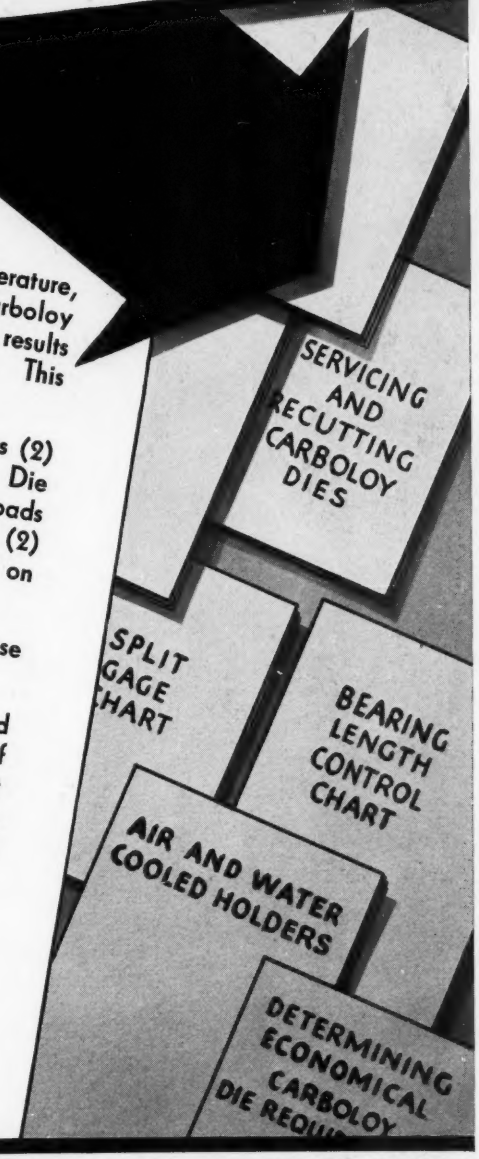
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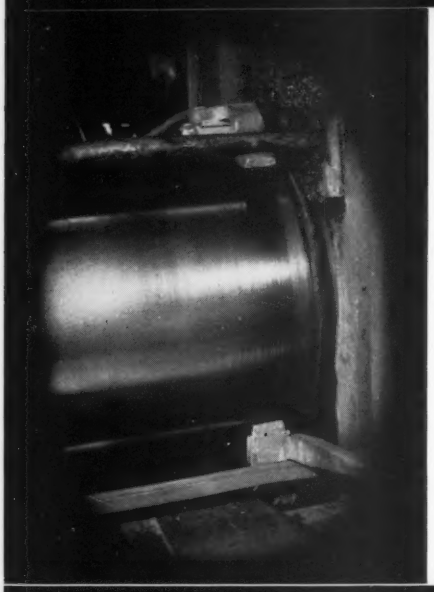

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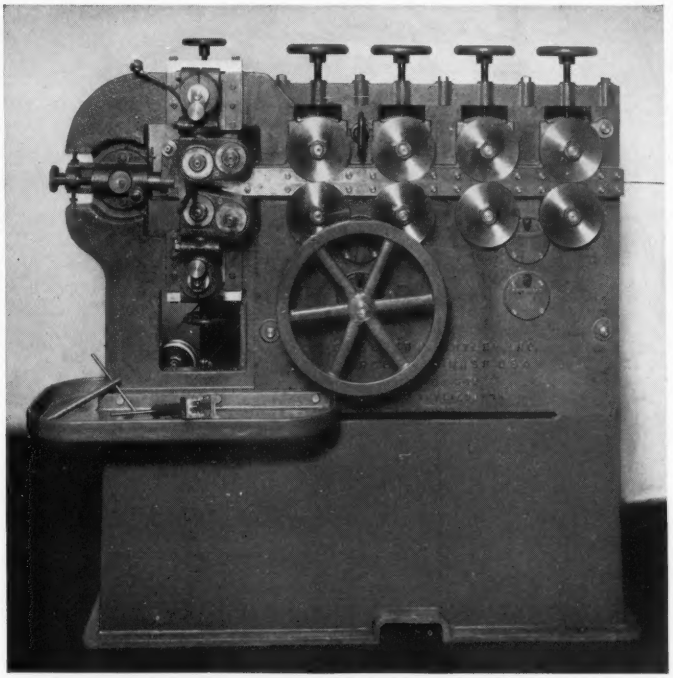

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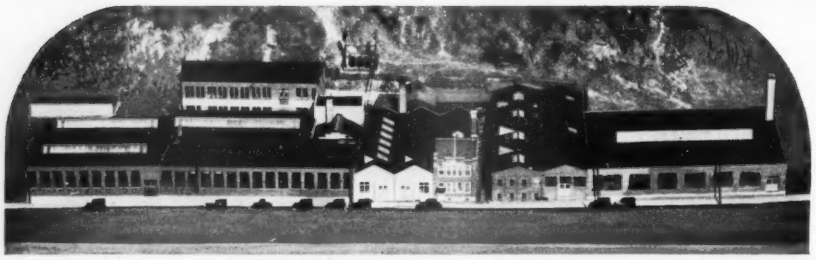

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✦ ✦ ✦

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✦ ✦ ✦

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A monthly publication devoted to the production of Wire, Rod and Strip, Wire Products and Insulated Wire and Cable.

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 10 January 1935 No. 1

Designated as

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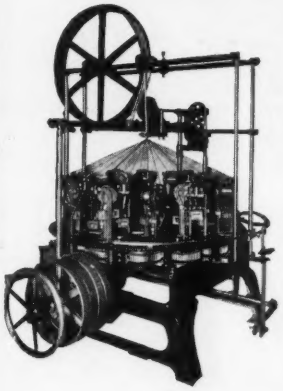

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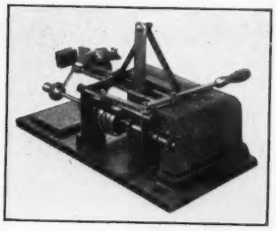

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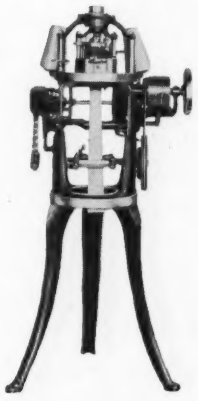

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DRAWING --- ROLLING--- EXTRUDING --- FORMING --- FABRICATING

Vol. 10 | January 1935 | No. 1

Testing and Controlling Metallic Coatings On Wire

By John H. Hruska
Metalurgical Engineer, Berwyn, Ill.

IN an exchange paper before the spring meeting of the American Association of Czechoslovak Engineers held in Chicago, **Professor A. Glazunov** presented a progress report on his new method for the determination of the characteristics of metallic coatings. According to present indications, the importance and value of this work was perhaps never more clearly demonstrated than in its practical applicability for the testing of surface treated wire. Costly equipment for precise testing and lack of accuracy when using the more common means of ascertaining the fundamental characteristics of coated wire—those were the principal criteria of the only two alternatives of tests available to the management of modern wire mills and to the consumer of wire as well.

✦ ✦ ✦

THEREFORE, the development of a rapid, accurate and cheap method to control metallic coatings should be of interest to a majority of the wire industries. With this in mind, the author has endeavored to summarize in the following paragraphs some of the outstanding advantages and the fundamentals of the new method.

Practical applicability of the Glazunov test in the wire industry. A rapid, accurate and inexpensive method to test and control metallic coatings on wire.

✦ ✦ ✦ ✦ ✦ ✦ ✦

Principle of the Glazunov Test

THE Glazunov test is based upon the changes of the electric potential between the anode and electrolyte during an electrolytic dissolution of a specimen representing the plated article intended for investigation. Simultaneous and periodical measurements of voltage and intensity of the electric current together with the exact determination of size and shape of the sample are the only experimental requirements in making the test.

✦ ✦ ✦

IN laboratory practice this procedure is carried out by utilizing the following equipment: one cylindrical platinum gauze electrode (about 1.25 in. dia., 2 in. high) serving as cathode; a voltmeter reading from 0 to about 6 V.; one ammeter of the laboratory type; a battery or other source of electric energy giving about 3 to 6 volts; specimens of the wire to be tested about 1.25 to 1.75 in. long. The electrolyte is a concentrated, slightly acidified solution of a salt (chloride, sulphate, etc.) of that metal used as metallic coating. A suitable glass container for the electrolyte, a stop watch, and a few connecting wires and minor parts complete the entire testing outfit.

✦ ✦ ✦

THE electrolytic action and its ultimate effects on voltage and intensity are recorded automatically or they are read in very short intervals, i.e. every 5 to 15 seconds. The observed readings are computed in suitable tabulations or better yet, they are represented graphically. Examples of both shall be given in the next part of this article.

✦ ✦ ✦

The Testing Procedure

THE testing procedure commences with connecting the sample to the positive pole of the electric current and inserting it into the center of the screen cathode, which latter has been

placed into the electrolytic cell. Immediately upon closing the circuit the surface layer (consisting of pure plating metal) is attacked by the solution. Since only a pure metal is being dissolved the volt as well as ampere readings will all be alike. The instant, when the intermediate or alloy layer will be exposed, however, will be marked by a deviation from the previous momentuous values of intensity and voltage. The diagram will therefore disclose the commencement of a curve instead of the horizontal straight line, which represented the foregoing dissolving action upon pure metal. These changes, as gradual as they may be, will continue until all the gradation alloys are dissolved. After their complete removal the original wire metal is exposed and again the readings become identical for subsequent intervals. This does not mean, that the actual value of current characteristics are the same for the coating and wire metals, both corresponding to their respective electro-chemical equivalents. For most of the commonly used wires the time required for the entire test does not exceed some ten minutes.

✦ ✦ ✦

Calculating the Thickness of Coating

THE thickness of the coating may then be calculated by substituting the observed data for the corresponding letters in the following formula:

$$d = \frac{e \times A \times t}{s \times l \times 2\pi r}$$

✦ ✦ ✦

IT will be noted that the expression (l X 2πr) is the surface of the exposed wire, while

d—thickness of surface layer in cm.
e—electrochemical equivalent
A—intensity in amperes
t—time in seconds
s—specific gravity in gm/cm³
l—length of the wire in cm.
r—radius of the wire in cm.

✦ ✦ ✦

AN example of a complete determination shall be given in one of the next paragraphs.

Accuracy of the Glazunov Test

SINCE the publication of the original paper by **Glazunov, V. Peták and F. Honzik** have made a thorough analytical study of the new method by first nickel plating pure copper wire under laboratory conditions and by using the thus plated specimens for a determination of the nickel coating by the Glazunov test. In both instances the exact amount of nickel was an especially desirable figure. Therefore, utmost care was exercised in verifying the results of theoretical calculations by suitable experimental determinations.

✦ ✦ ✦

Weight of Coating Determination

IN accordance with our present knowledge of basic principles of electro-chemistry, the weight of nickel applied in electrical plating may be determined from the well known law of Faraday, viz:

$$M = e \cdot A \cdot t$$

where

M—weight of elementary nickel in mgr.
e—electrochemical equivalent (0.304 for Ni).
A—electrical intensity during plating.
t—duration or time of plating in seconds.

BY substituting actual data obtained when plating a 4 mm. (0.158 in.) copper wire 7.75 cm. long for 35 minutes (2100 seconds) by applying an intensity of A = 0.05 Amp. the following equation results:

$$M = 0.304 \times 0.05 \times 2100 = 31.92 \text{ mgr.} = 0.03192 \text{ grm.}$$

✦ ✦ ✦

BY simple mathematics the amount of nickel per 1 cm. length corresponds to

$$M_{cm} = \frac{0.03192}{7.75} = 0.00412 \text{ grm.}$$

FOLLOWING the original program the same wire was then carefully cleaned with alcohol and ether and a thorough determination made of the obtained coating by carrying out exactly the procedure as advocated by Glazunov.

✦ ✦ ✦

ALTHOUGH readings of voltage and intensity were made every five seconds, only a condensed tabulation of the observed values is given in Table A.

✦ ✦ ✦

Set of Graphic Readings

DIAGRAM No. 1 shows the complete set of readings graphically. A study of these results reveals the fact, that during the first 120 seconds after closing the circuit the intensity remains constant at 0.270 Amp. Only pure

TABLE A.

CHANGES OF VOLTAGE AND INTENSITY DURING GLAZUNOV TEST WITH 0.158 INCH NICKEL PLATED COPPER WIRE

Seconds after closing circuit	Voltage	Amperage
0	1.00	0.290
5	1.10	0.275
10	1.20	0.270
60	1.20	0.270
120	1.20	0.270
125	1.21	0.268
135	1.22	0,265
140	1.23	0.264
150	1.24	0.260
155	1.25	0.258
160	1.26	0.257
165	1.27	0.256
170	1.28	0.255
175	1.30	0.254
295	1.30	0.254

nickel was dissolved during this period. The weight of pure nickel in the metallic or elementary surface layer is thus

$$M_{Ni} = 0.304 \times 0.27 \times 120 = 9.8496 \text{ mgr.} = 0.00985 \text{ gr.}$$

✦ ✦ ✦

THE actual measured length of the originally 7.75 long sample was shortened to 3.4 cm. by covering with wax and we obtain therefore the amount per 1 cm. length

$$M_{Ni\ cm} = \frac{0.00985}{3.4} = 0.00290 \text{ gr/cm}$$

✦ ✦ ✦

THE volume of metallic nickel per cm. length of wire may be calculated by using the specific gravity of nickel as 8.68 gr/cm³:

$$\frac{0.00290}{8.68} = 0.000337 \text{ cm}^3$$

THE thickness of the surface layer of pure nickel is finally 0.000337

$$d = \frac{0.000337}{3.14 \times 0.4 \times 1.0} = 0.000268 \text{ cm}$$

✦ ✦ ✦

DURING the period corresponding to 120 to 170 seconds after closing the circuit (i.e. 50 seconds), the voltage as well as the intensity become variable. The average of intensity for this interval is 0.262 Amp. The concentration of nickel in the intermediate zone is ordinarily around or in excess of 90 per cent, the percentage of copper being about 10 per cent. This proportion corresponds to 0.236 Amp. for nickel and 0.026 Amp. for copper. The amount of nickel in the alloy is therefore

$$M_{Ni}\text{alloy} = 0.304 \times 0.236 \times 50 = 0.003584 \text{ gr.,}$$

which amounts to 0.00105 gr. of nickel per cm. of the exposed sample. The total amount of nickel contained in 1 cm. wire is consequently 0.00290+0.00105=0.00395 gr./cm.

✦ ✦ ✦

THE same relationship holds true for the calculation of elementary copper in the intermediate zone:

$$M_{Cu}\text{ alloy} = 0.3295 \times 0.026 \times 50 = 0.0004316 \text{ gr.}$$

which corresponds to 0.000115 gr/cm.

✦ ✦ ✦

BY adding the weights of nickel plus that of copper we obtain the total weight of the alloys, thus 0.00105 + 0.000115 = 0.001165 gr/cm.

✦ ✦ ✦

THE specific gravity of nickel being 8.68 and that of cop-

(*Please turn to page 46*)

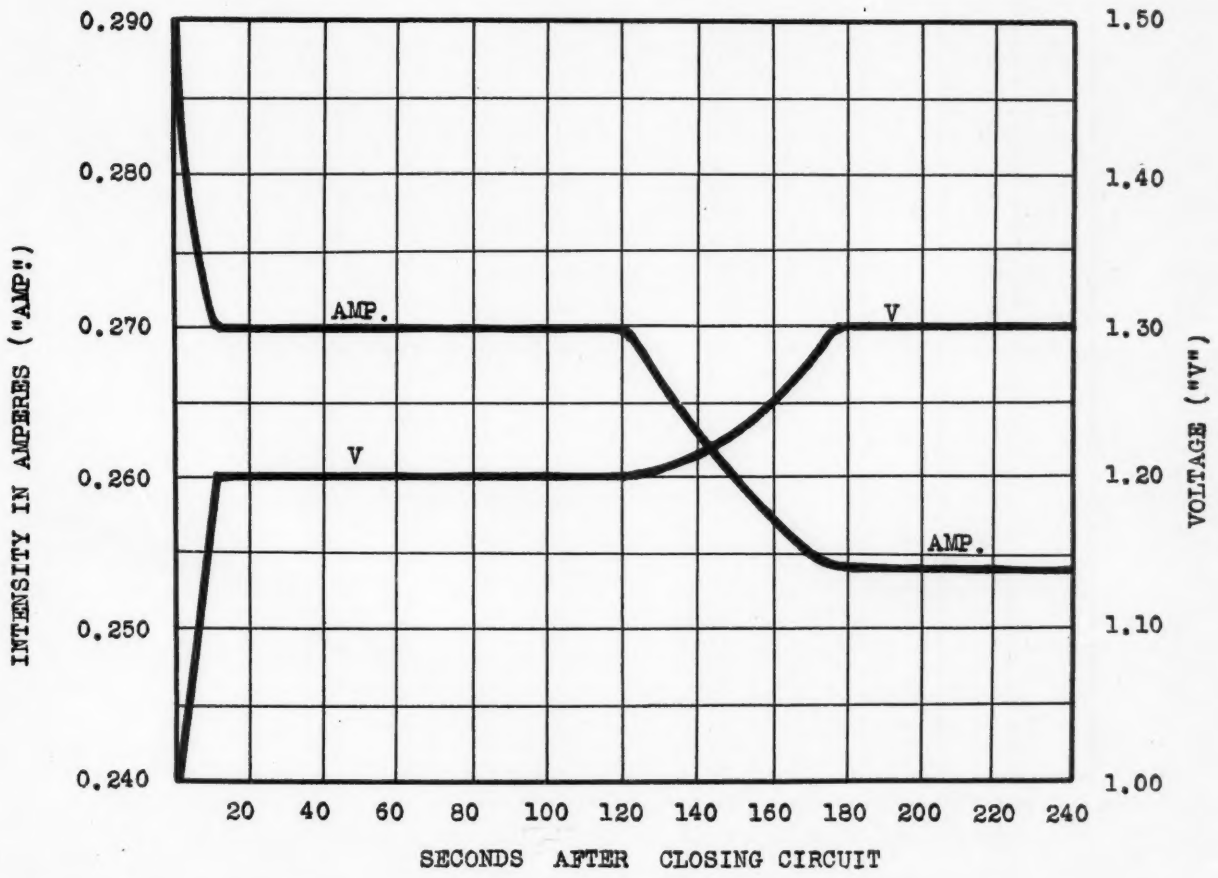

Fig. No. 1. Graphical representation of changes of voltage (V) and intensity (AMP) during Glazunov test. ✦ ✦ ✦ ✦ ✦

Bonus Figures Can Lie

AS TOLD BY

K. B. WHITE

Head Efficiency Dept., Simplex Wire & Cable Company, Boston, Mass.

THERE are certain inherent mathematical inaccuracies in efficiencies of machine-tending operations as used for control purposes. Because of the varying amounts of labor in the job, they often reflect, not simple changes in efficiencies of operation, but a combination not under the control of the operator or supervisor.

✦ ✦ ✦

BY efficiency we mean the ratio of the time allowed to the time taken on a job. Efficiencies are usually the basis of bonus payment to the workers and are used by the management for control. The efficiencies in general use are of two classes which may be called "end efficiencies" and "labor efficiencies". In end efficiencies the time allowed for a job is the labor time with the machine stopped, plus the running time. In labor efficiencies the time allowed is only that for labor. A job with but little labor in proportion to the total time will inevitably show a higher end efficiency than one with a relatively larger amount. It is obvious that the use of end efficiencies alone is unsatisfactory when there are any material variations in amounts of labor in the job. If we consider the labor efficiency only, as many of our newer and more widely used systems do, the results are exactly reversed and equally unsatisfactory.

✦ ✦ ✦

IT should also be obvious that, as the proportion of the labor varies from week to week between the one extreme case and the other, the efficiency for the period on either of the bases will reflect a complex adjustment between the real efficiency of the operating force and the average amount of labor in the job. The latter factor is not, as a rule, under their control.

Two efficiencies are considered because bonus figures can lie due to certain inherent mathematical inaccuracies in efficiencies of machine-tending operations as used for control purposes. ✦ ✦ ✦ ✦

THUS, in setting up our bonus plan, we decided that an operator should be paid bonus only for actual work done, and not for watching his machine do it. In most of the operations in a plant manufacturing insulated wire and cable, semi-skilled operators feed machines which, when started, run at a fixed and constant speed over which the operators have no control.

✦ ✦ ✦

AS a rule, the larger sizes require more feeding, and therefore more labor per unit, than do the smaller ones. If we used only end efficiency or labor efficiency, we would be measuring the average size from week to week as much as the efficiency of the workers.

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Application to Braiding Department

THE scheme was first applied in the braiding departments where a cotton braid is applied over the insulated conductors. The machines are equipped with automatic stops, and the operator's task consists in replacing the tubes of cotton as they become empty. The larger the wire, the more tubes are required per thousand feet. As a result of the bonus plan the number of braiders per operator was increased from 30 to 100. The girls received bonuses which amounted to about 50 per cent of their wages. The labor costs went down and the end efficiency changed but little.

✦ ✦ ✦

ALTHOUGH developed originally as a wage incentive, the plan has since been expanded to form the basis of the management's labor control and of the standard cost system. On each operation we figure both efficiencies. Knowing the labor rate and the burden rate, the number of machines per operator for most economical manufacture can readily be computed. For instance, we may find that on an operation in a certain size range the labor time allowed is 10 per cent of the total time. We know from experience that the operator can make about 50 per cent labor efficiency and still maintain a satisfactory end efficiency, so we give him five machines. On a larger size, which might show 15 per cent labor, we would give him only four. Such adjustments are made by the foremen when they schedule their work, and on a practical rather than a purely mathematical basis.

✦ ✦ ✦

WE also know, if both efficiencies go up or down, that there has been a real change due to management or worker. If they go in opposite directions, we know that there has been only a change in average size during the period.

✦ ✦ ✦

Establishment of Labor and Machine Standards

THE application of the scheme involves the establishment of labor standards by time study and machine standards by an engineering analysis of the equipment. These are translated into man hours allowed per unit. Production and time are reported on the form shown in Figure 1, and efficiency of the operator is figured weekly.

SMALL STRANDING DEPT. 36-B CNTR OPERATION Stranding (55-2)

OPERATOR NO. ____ HOURS 40 LOST 3.2 IDLE 1.4 NET 236.4

NO. MACHINES 5 WEEK ENDING Dec 14 KIND MACHINES SM-7-Bot

T. A. HOURS L-M	T. A. HOURS L	EFFICIENCY L-M	EFFICIENCY L	% BONUS
200.7	281	84.8	58 3	28 3

RATE 1 % FOR 1 % LABOR EFFICIENCY OVER 30% ON $25.00 BASE — BASE WAGE $25.10 — BONUS $ 7.10

SIZE / KIND	HOURS
FRI	
SAT	
SUN	
MON	
TUES	
WED	
THURS.	
TOTAL	
L-M FACTOR	
L FACTOR	
HOURS PER	

APPROVED _____ EFFICIENCY DEPT. CHECKED _____ FOREMAN

Fig. 1. Production and time are reported on this form. Efficiency is figured weekly.

Operation of System

ALL bonus starts at 30 per cent labor efficiency; the rate is 1 per cent bonus for 1 per cent increase in efficiency above that figure. It is paid on a base wage which is the same for all operators on the operation and is approximately equal to their average daily wage. The management expects that under bonus stimulus the efficiencies will average from 50 to 60 per cent and the bonus, accordingly, from 20 to 30 per cent—which it generally does.

A VARIATION in the amount of labor in the job, due to a change in sizes run, may affect the bonus earned quite as much as an actual increase in efficiency. It seems reasonable to base the bonus on this labor efficiency because the increase in the "labor in the job" actually meant that the operator did more work.

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THE scheme is applied both to individual workers and to groups. Indirect workers are included by allowing them a certain proportion of the "time allowed" of each worker whom they serve. Exceptions are made of jobs which are all-manual. For such jobs the rate is 1 per cent bonus for 1 per cent increase in labor efficiency above 60 per cent.

✦ ✦ ✦

FROM the standpoint of managerial control, the end effici-

(*Please turn to page 34*)

WEEKLY REPORT OF BONUS OPERATORS

DEPT.

WEEK ENDING. ____ 193__

SYMBOL	OPERATION	KEY NO.	BONUS $	BONUS %	HOURS T.T.	EFFICIENCY L.M	EFFICIENCY L	MACHINE HOURS LOST	MACHINE HOURS IDLE	MACHINE HOURS NET	T A. HOURS L.M	T A. HOURS L	PRODUCTION IN _____

Fig. 2. Essential figures from individual production record sheets are compiled in a weekly report of bonus operators. Group totals show complete picture to management and foreman.

Fifteen Generations in the Wire Industry

By Kenneth B. Lewis
Consulting Wire Mill Engineer, Worcester, Mass.

The development of the wire industry in England as told by Nehemiah Highley whose personal recollections cover a period of nearly eighty years.

I SPENT a rainy Sunday afternoon in April with an old gentleman in Carrick, Pa. talking over old times and old practices in the wire mills. drawing on his nearly eighty years of personal observation backed by about fifteen generations of family history and tradition. When I left I found I had in my hand one end of a long thread of incidents, causes, and consequences which stretched back through no less than eight centuries to a starting point at the court of King Stephen, in twelfth century England. As this thread happens to be of steel wire, perhaps the readers of WIRE AND WIRE PRODUCTS would be interested in tracing it out.

✦ ✦ ✦

Historical Background

THE story starts about the year 1147 A. D. This decade, say from 1145 to 1155 was one of extraordinary interest and importance. Great figures were acting out their parts upon the stage of inating or unfolding, events of the sort which leave permanent marks and profoundly affect the course of history. It seems worth while to sketch in a hasty background for our little wire drama.

✦ ✦ ✦

Conditions in England

IN England the Normans had pretty well consolidated their position after their recent conquest of the island, a conquest so recent that no doubt many a chimney corner held a tottering old Norman who boasted of his exploits among the bowmen of William, Duke of Normandy, known to his friends as William the Conqueror and to his enemies as William the Bastard. And doubtless many an old Saxon still mourned a personal loss in King Harold Hardrada whose body he had defended with his spear on Hastings Strand. The English throne was occupied by a usurper, Stephen of Blois. The Empress Maud, rightful heir, daughter of Henry I, widow of the Emperor Henry IV of the Holy Roman Empire, wife of Goeffrey Plantagenet, held court wherever her army pitched their tents, and kept up with varying fortunes a spirited fight for her rights, and for the succession of her son, young Henry Plantagenet, a boy in his teens, who later reigned as Henry II.

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Conditions in France

FRANCE was ruled by Lois VII, a France consisting actually of little but Paris and its suburbs, but claiming the allegiance of provinces whose area more than equalled that of modern France. Among those feudal lords who came annually to Louis' court to renew formally their oaths of allegiance was Goeffrey Plantagenet, Count of Anjou, who had just succeeded in demonstrating to the Norman nobles, in the good old-fashioned way, his right to be called Duke of Normandy. With him came his little son Henry, already called Count of Anjou, the son of Empress Maud, and legitimate heir to the throne of England. One might wonder whether young Henry, as he knelt to kiss the hand of Queen Eleanor, was visited by any premonition—any vision of the future. For his sovereign lady was none other than Eleanor of Aquitaine, ruler in her own right of Guinne, Poitu and Aquitaine, vastly more powerful than the pale, irresolute timid and pious Louis. Eleanor, the most beautiful and accomplished woman of her time, a perfect fountain of energy, passion, and vitality, was destined soon to divorce Louis and to become the wife of young Henry Plantagenet, Queen of England, and ancestress of no fewer than fourteen English Kings in the direct line of succession.

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The Eastern Empire

EMPEROR Alexius Comnenus ruled over the rapidly shrinking Eastern Empire centered at Constantinople, hemmed in by the Saracens. Bernard of Clairvaux was preaching the Second Crusade and the hosts were already afoot, the French led by Louis and Eleanor, the Germans by the Emperor Conrad, seconded by Frederick of Suabia who was later to become famous as the Emperor Frederick Barbarossa. A party of English and Flemish Crusaders started for Palestine by the sea route, but getting impatient, and figuring no doubt that a Mohammedan counted one point no matter where you killed him, stopped off at Lisbon and captured the city from the Moors, who then held the entire Spanish peninsula. They pushed on into the country, found the hunting pretty good, and wound up by establishing the Christian Kingdom of Portugal. This incident led to a treaty between Portugal and England which has ruled unbroken for eight hundred years, and is probably responsible for the Englishman's addiction to port wine.

OF life in general it may be said that it was rough, adventurous, insecure, and unsanitary. There probably was not a bath-tub west of Constantinople, nor a sewer. A dinner guest, upon seating himself at a Noble's table, pulled a horn spoon out of his boot and a dagger out of his belt, picked up a broiled bone in his fist and went at it. If he got a plate it was because Royalty was the host. Finishing his dinner he wiped his mouth with the back of his hand, his hands and dagger on his jacket, and either fell or crawled under the table to sleep off his wine, among the rushes, dogs, fleas, and gnawed bones. The boudoir of the fairest lady of the land probably smelled like the back hall of a Polish boarding house in the Stock Yards, but nobody noticed it.

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First English "Letters Patent" on Wire

AGAINST this background of Arcadian simplicity, political intrigue, battle axes and piety, our story begins in 1147. One Walter de Clare, of an influential and wealthy Norman family, friend and supporter of King Stephen, built an abbey at Tintern in Monmouthshire near the Welsh border, which he turned over to the Cistercian monks. The foundation flourished under the powerful protection of de Clare's kinsmen the successive Earls of Pembroke.

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FOUR centuries passed; the Plantagenets ruled, died, ruled again, and finally, as the direct line died out, were succeeded by their kinsmen the Tudors. Under the eyes of four Tudor sovereigns the second act of our little drama was played. Henry VIII was for many years at odds with his spiritual superior the Pope. First he insisted, for political reasons, upon marrying the widow of his older brother Arthur, Catherine of Arragon, daughter of Ferdinand and Isabella of Spain, with whom it was important that England be on intimate terms. The Pope finally consented to declare Catherine's previous marriage to Arthur void. Years later Henry, disappointed of a male heir, thoroughly tired of an ageing and invalid wife, and extremely desirous of marrying the young and attractive Anne Boleyn, asked the Pope to annul his marriage to Catherine on the ground that it never should have been permitted in the first place. This the Pope quite properly refused to do. Henry solved the problem by divorcing the Church from Rome and assuming the position of its spiritual head; in other words he established the Church of England. As a natural consequence Henry turned the monastic orders out of their comfortable quarters and appropriated their very considerable wealth and income. Tintern Abbey was abandoned in 1535 and, after the manner of government owned property, promptly went to seed.

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HENRY died, Edward VI, his feeble son by one of his wives, whose number I have forgotten, reigned a few months and died. Mary, daughter of the divorced Catherine, the "Bloody Mary" of history, tried to re-establish the Church of Rome, roasted a few bishops, and died. The throne was claimed for Elizabeth, daughter of Anne Boleyn, wife number two. Elizabeth may or may not have been a Tudor, contemporary gossips never agreed on the point, but from some source she inherited a Tudor capacity for business. She induced her Assay Master of the Mint to bring over into England in 1564 one Christopher Shutz, a Saxon, skilled in metallurgy, and granted him letters patent to "search, dig, and mine for the calamine stone, (zinc ore) all kinds of battery ware, (malleable metals) cast work and wire of latten (brass) iron, steel and battery, to make, manure, (manufacture) and work into and for all manner of plate and wire."

✦ ✦ ✦

The First English Wire Mill

SHUTZ searched the west of England for a favorable combination of ore, fuel and available water power, and finally found a site on Angidy brook near Tintern Abbey. Without a doubt the presence of the ruined abbey was a large factor in his choice, for the construction of the first wire mill, fifty feet long and thirty feet wide, was carried out with stones from the Abbey walls, as was also the building of workmen's cottages.

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Early English Process

OF this successful venture John Ray, writing in 1678, says: "They take little square bars made like bars of steel, which they call Osborn Iron, wrought on purpose for this manufacture, and strain them at a furnace with a hammer moved by water (like those at the iron forges, but lesser,) into square rods of the bigness of one's little finger, or less, and bow them round. When that is done they put them into a furnace and anneal them with a pretty strong fire for about twelve hours: after they are annealed, they lay them in water for a month or two (the longer the better), then the rippers take them and draw them into wire through two or three holes.

✦ ✦ ✦

THEN they neal them again for six hours, or more, and water them the second time about a week; then they are carried to the rippers, who draw them to a two-bond wire, as big as a great pack thread. Then again they are annealed a third time, and watered about a week as before, and delivered to the small wire-drawers, whom they call overhousemen; I suppose only because they work in an upper room. They anoint the wire with train-oil to make it run the easier.

✦ ✦ ✦

THERE is another mill, where the small wire is drawn, which, with one wheel, moves three axis that runs the length of the house, on three floors, one above another. The description whereof would be tedious, and difficult to understand without a scheme, (drawing) and therefore I shall omit it."

✦ ✦ ✦

Wire Workers Imported From Germany

CHRISTOPHER Shutz brought over with him from Germany

(*Please turn to page 38*)

How Piano Wire Is Used In Constructing Bridge Models

By C. W. Geiger, San Francisco, Cal.

Work on the actual design of the $75,000,000 San Francisco-Oakland Bay Bridge was started by state engineers as a result of a series of tests with piano wire models made at the University of California Engineering Department. ✦ ✦ ✦

THE use of models for structural engineering is a rather recent development, although models have been used for hydraulic and mechanical engineering purposes for some little time. In structural engineering models have heretofore usually been built of celluloid. Such models have been used extensively in arch dam and arch bridge work. One model of a suspension bridge was used some time ago by Professor O. E. Beggs, Princeton University. This was the Mount Hope suspension bridge. The Berkeley tests represent however the first use of suspension bridge models it is said for actual design of this type of structure. While the model can never replace calculation it however presents valuable means of checking calculations and eliminates a large percentage of them.

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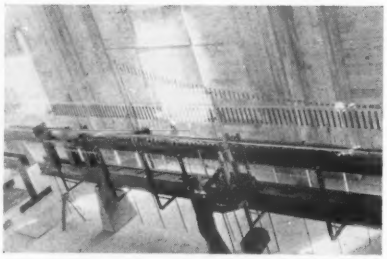
ALL wires, trusses, piles, the roadway, towers and pillars in the bridge models at Berkeley have been given tests representing the effects of a "100-mile an hour gale" and have proven satisfactory, it is said.



View of experimental testing apparatus from above. ✦ ✦ ✦ ✦ ✦

THE model investigation is under the general supervision of Professor R. E. Davis, director of the new Engineering Laboratory, university of California. Three models have been built each to test a proposed design for the bridge.

The models are built on a 1 to 100 scale representing the 9,000 foot main crossing between San Francisco and Yerba Buena Island, which represents the major problems of span and clearance.

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THE models are built of piano wire and cold rolled steel shapes. Each model is erected on a base of 12 inch steel channels mounted on concrete piers three feet above the floor level.

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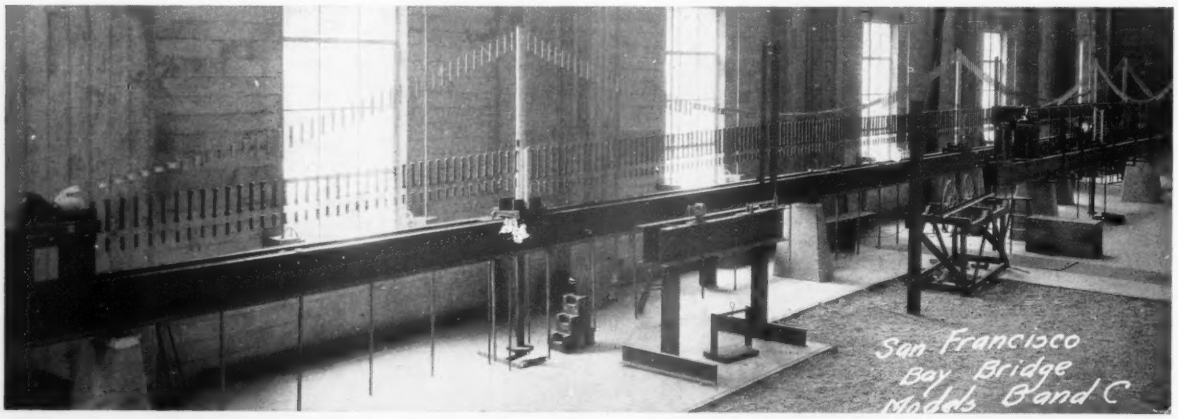
PROFESSOR O. E. Beggs of Princeton University was associated with Prof. Davis during the original design and construction of the models. R. A. Tudor, State Highway Engineer, assisted. C. H. Purcell, chief engineer for the California Toll Bridge Authority is in charge of the entire project.

✦ ✦ ✦

THE measuring of stresses and deformation is done by various pieces of special apparatus. In measuring stress in the main cables the tests are made for various conditions of live load, temperature and wind.

(*Please turn to page 41*)



San Francisco Bay Bridge Model on which tests were made at the Engineering Materials Laboratory of the University of California. ✦

Outdoor Exposure Tests of Galvanized Wire And Wire Products

THE American Society for Testing Materials has been for some time actively engaged in developing plans for a systematic study of the outdoor atmospheric corrosion of galvanized wire and wire products. Farm fencing, barbed wire, chain link fencing, telephone and telegraph line wire, tie wires and strand (cable) are typical of wire products included in these proposed tests.

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THE tests are being planned and will be carried out by Committee A-5 on Corrosion of Iron and Steel under the direction of a special Wire Test Committee carefully selected to bring to the work a thorough knowledge of the manufacture, sale and the proper use of these fence products. The Wire Test Committee comprises recognized authorities on fence economics enlisted from our National Agricultural Societies and State Experiment Stations, technical experts from the steel manufacturers, galvanizers, and zinc producers, representatives from the commercial departments of fence manufacturers, and technical representatives from industrial consumers of wire and wire products.

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BECAUSE of the widely different uses to which these products are put, the present discussion is confined almost entirely to the portion of the program dealing with farm fencing and barbed wire.

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THE work has two major objectives: (1) to obtain useful engineering information concerning materials generally used for fencing or which offer promise of economic suitability for use in fencing in the near future; (2) to assist in setting up national standard specifications for fencing and barbed wire which will afford consumers an adequate guide in purchasing these materials. Under (1) above, it is planned to study those factors of major importance in determining the economic suitability of various types of fencing for particular farming areas.

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BRIEFLY, the general test program is as follows: Samples of typical fence fabrics and the wires from which they are made are to be supplied by representative manufacturers cooperating in these tests. With these samples, each supplier will submit their early history, chemical composition and physical constants of the base metals and coatings, photomicrographs showing the metallic structure of the product and the nature of the bond between the base metal and its coating. When all samples have been concentrated at a central testing laboratory, their commercial identity will be completely removed by a disinterested director of tests. Before being accepted for test, however, all selected materials will be carefully checked at the test laboratory to insure that their chemical and physical properties are as intended by the supplier. When next these materials become available to the Wire Test Committee for actual erection at the test sites, they will bear only serial number designations classified as to the type of base metal, wire size, type and weight of coating, etc. They will then be shipped to the several test sites and mounted on their proper racks.

✦ ✦ ✦

FOUR types of fencing are to be tested as follows:

Type	Gage of Top and Bottom Line Wire	Gage of Intermediate Line and Stay Wires
1	9	9
2	9	11
3	10	12-½
4	11	14-½

Note—All samples are to be of standard hinged joint type fence 39 inches high with 6-inch stays.

ON these types of fencing, various weights of zinc coating will be applied by a variety of coating processes. The weight of coating classes will range from 0.2 oz. to 1.8 oz. per square foot of uncoated wire surface. Coatings still heavier than 1.8 oz. will be tested if such samples are available when the tests are begun. Four types of stainless steel fencing will also be tested and, if available, copper coated and lead coated fencing. Bare (uncoated) wires will, in all cases, be exposed as control samples at each test location.

✦ ✦ ✦

BARBED wire samples will, in all cases, be made from 12½ gage line wire with 14 gage-4 point barb hog wire. Again a wide range of zinc coatings will be tested and in addition barbed wire carrying aluminum barbs.

✦ ✦ ✦

THE fabricated products, such as fence, will be erected in the usual way at the selected test sites and left undisturbed for observation as to general behavior, appearance, first signs of rusting, rate of spread of rusting, decrease in cross section of wire, etc. The unfabricated wire specimens are to be specially mounted in small racks to facilitate shipment to a central testing laboratory for physical examination at predetermined intervals. Here, their tensile strength and elongation will be followed as weathering proceeds and the nature of the corrosion attack noted. Since these tests destroy the samples, several samples of each type of wire will be exposed at each location, one rack being shipped in at each testing period, the other remaining for later examination.

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THE Wire Test Committee has endeavored, with the funds available for this work, to set up

these outdoor weathering tests in widely scattered areas of the United States in which fences are used in large quantities. Table A outlines the areas chosen and the materials to be tested. Only those materials checked at each location will be tested at this site.

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SOME conception of the magnitude of this investigation is obtained from the numerical summary of the samples involved as shown in table B.

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THE farm field fencing and barbed wire samples are each one rod in length, and will require the erection of at least one fence post per sample per location. Since the fencing and strand are not brought in for inspection, only one set of samples per location is required. In the case of the bare wire samples a complete set is to be brought in and tested to destruction over a number of test periods which considerably swells the grand total of individual samples involved in the test.

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IT is recognized that certain factors which markedly affect the service life of fencing, such as mechanical damage and ruggedness of construction of the fence on the farm, will not be studied in the tests now planned. Such tests would require test facilities, resources and a testing personnel not now available to the American Society for Testing Materials. Estimated conservatively, however, the test data available upon completion of the program will go far toward enabling the farmer or his technical advisor to make a proper comparison of the performance of fences which differ as regards base metal, wire gage, type and weight of coating, and to decide which type will meet his particular needs most conomically.

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THE Wire Test Committee has recognized that fence fabric or wire products commercially available on the open market would not be a suitable source of supply for which to draw its test samples. The test program is focused entirely on the comparative evaluation of types of fencing —various base metals, different types of metallic protective coatings for steel wire, a wide range of weights of coating, various gages of wire. To properly evaluate each of these variables, it will be necessary that all line and stay wires of the same gage and weight of coating of each class of fence be made from the same bundle of wire; further, that every wire in a sample of fence, whether stay or line wire, carry the weight of coating designated in each class.

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FURTHERMORE, in order to obtain as much information of definite character as possible by these exposure tests, the Committee feels it is important that these samples should represent a greater number of classifications as to weight of coating than would be obtainable from commercially available specimens; it is also important that these various types as to weight of coating should be controlled to as narrow a range as possible. It was, of course, well recognized by the Committee that commercial brands of fence or other wire products could scarcely be fitted into this program and the wire and fence manufacturers have agreed to prepare specially these various specimens so that in the end the Committee would have dependable information which could be used as a means toward the economic evaluation of all the various types of product that are available to the farmer now and that might later become available after this program has been completed.

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THE Committee has enjoyed the whole-hearted support of most of our nationally recognized fence manufacturers who have contributed not only to the funds necessary to finance the project, but the engineers' time, the supply-

(*Please turn to page 41*)

TABLE A. LOCATION OF TEST POINTS

	Farm Fence and Barbed Wire	Wire (Unfabricated)	Strand (Cable)	Chain Link Fencing
Pennsylvania State College, State College, Pa.	x	x	x	
Purdue University West LaFayette, Ind.	x	x	x	x
Texas A. & M. College College Station, Texas	x	x	x	
Iowa State College Ames, Iowa	x	x	x	
Cornell University Cornell, N. Y.	x	x	x	x
Kansas State College Manhattan, Kansas	x	x	x	
*Pittsburgh, Pa.		x	x	x
*Sandy Hook, N. J.		x	x	x
*Bridgeport, Conn.		x	x	x

*Note: The starred locations are not rural, but represent industrial or seacoast locations where further information on the durability of chain link fencing and other fabricated wire products is desired.

TABLE B. NUMERICAL SUMMARY OF SAMPLES INVOLVED

	No. of Samples per location	No. of Locations	Total No. of Samples per Exposure Period	Grand Total
Plain Wire	142	9	1,278	12,474
Farm field fencing	96	6	576	576
Barbed wire	27	6	162	162
Strand	13	9	117	117
Chain link fencing	6	5	30	30
				13,395

The Development of Wire Rope Pumping

By Percy R. Clark and Lutz F. W. Schropp

A paper presented to the Roumanian Branch of the Institution of Petroleum Technologists. The original research was published in "WIRE & WIRE PRODUCTS" December, 1930. This paper is a discussion of the further development of wire rope pumping. ✦ ✦ ✦

IT is now some three years since a paper was read before the Roumanian Branch of the Institution of Petroleum Technologists on wire rope pumping. In view of the case then put forward in favor of this method of production, it might very well be asked today why greater progress has not been made in the application of the wire rope to pumping oil wells.

✦ ✦ ✦

WHY is it that even today some of the Roumanian Oil Companies are still looking sceptically at wire rope pumping?

Many reasons can be given for this. Some of them are:

(1). MAN'S general resistance to new ideas—a resentment at having one's established train of thought disturbed—a desire to avoid, if possible, the effort of learning new processes—a dislike of the responsibility for the failures which are inevitable until the right method of work with a new process has been established.

At the first trial results are bound to be indifferent.

Every art has to be learnt, and rope pumping is still in its infancy in Roumania.

✦ ✦ ✦

(2). THE larger concerns, i. e. the large oil producers, who can perhaps best afford to carry out experiments, are the very people who have large stocks of pump rods and little enthusiasm for the application of a new process which might render such stocks useless.

✦ ✦ ✦

(3). A FEW of the small companies, whom sheer necessity has driven to seek for means of working more economically, have obtained good results from rope pumping, but unfortunately the prestige of these concerns is not sufficient to command a following.

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(4). WE might also add that the rod manufacturer naturally endeavors to discourage the use of the wire rope for this purpose.

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Advantages of Wire Rope Pumping

WE will now pass on to consider some of the undoubted advantages and particularities of wire rope pumping.

(1). Greater speed in lowering and extracting the plunger.

NO couplings to unscrew. With a well of a depth of, say, 1500 metres this means a very considerable economy in time and labor. Of course one can raise the objection that a normally working pump may go six to eight months before it is necessary to pull it out, and a few extra hours spent in withdrawing and replacing the piston are not of much account. However that is not entirely the case.

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PRODUCTION is likely to be more steady if the plunger is subjected to constant supervision. With a wire rope this only takes 15 to 30 minutes, and one can thus inspect the plunger, repair the liner, and generally clean out the valves, etc., every few days. This constant extraction of the plunger is more particularly important in the case of wells containing paraffinous oil. To avoid tubing becoming choked up, the pump has to be extracted almost daily. In such circumstances rod pumping can probably not be made to pay. With rope pumping, however, by attaching a paraffin cutter to the rope, when extracting the piston, the tubing can easily be cleaned out and an accumulation of paraffin sediment avoided.

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(2). Another point in favor of the wire rope is the possibility of using cheaper pumps than is the case with rod pumping.

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A PUMP used by the Gallia Company consists of a hard polished, long steel cylinder without any liners. Below there is an ordinary foot valve and gas anchor. The piston consists of separate rings of soft bronze, which reduces the wear on the steel cylinder, but on the other hand the rings are in themselves strong enough to withstand 4 to 6 weeks pumping. These pistons were manufactured in the company's own workshop and proved very resistent to wear by sand, and much cheaper than those generally used of chrome leather, composition cups, etc. The plunger is made up of about 10-15 soft bronze rings of 3 cm. width each, and they are put on a guide tube with upper and foot valves.

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FURTHERMORE, if the foot valve is constructed on the demountable principle (Riterventil) it need never be taken out.

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3. The connection between the plunger and the rope is made by means of a rope socket attached to a sinker bar.

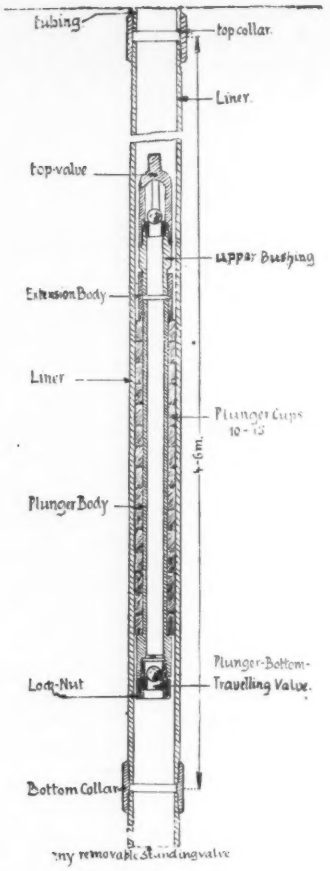

Fig. 1. Pump.

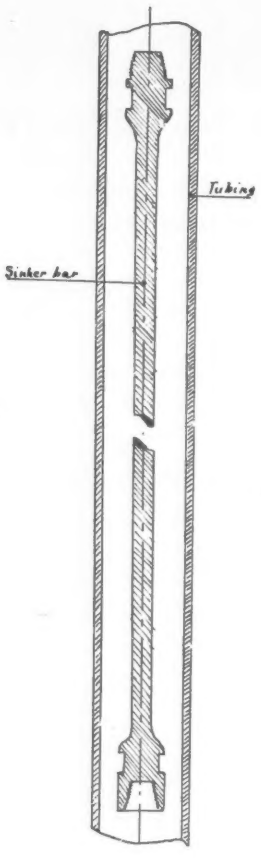

Fig. 2. Sinker Bar.

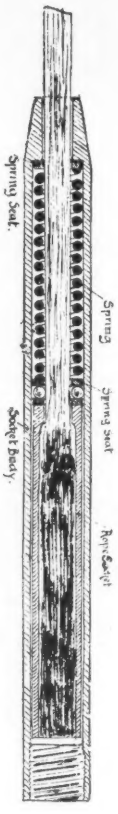

Fig. 3. Rope Socket.

FURTHER bars are attached here in order to decrease the wear on the pump, which would otherwise arise from elongation of the rope. The disadvantages of a rope, as compared with sucker rods, are its flexibility and stretch tendency; therefore by some means or other the effect of these inherent qualities of the rope must be modified. To this end one weights the rope by attaching sinker bars to the lower end. The amount of this weight depends on the depth of the well and the size of the pump.

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ONE must carefully watch the movement of the pump in order to ascertain exactly the right number of sinker bars to be used. For this purpose one first places a few bars only in position and then gradually adds bars until the pump is working quietly, without shock, and giving a regular flow of liquid.

At the commencement, in order to ascertain more exactly the weight required, tests can be carroed out by means of ordinary sucker rods. This is especially important when a new rope is placed in work, for one should be particularly careful to avoid overstretching a rope before it is set.

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IN view of the wire rope's inherent tendency to elongate at the commencement of work, it should be inspected every hour during the first twenty-four, and after that, say, once a week, in order that any elongation that has accrued may be taken up. Excessive elongation of the rope can be recognized by the shortening of the pump strike, which obviously must take place as the piston sinks deeper. Sometimes the strnetch is detected by the vibration arising from the knocking of the piston against the foot valve.

WHEN one uses a pump fitted up as indicated above, the elongation of the rope plays a less significant role. In such pumps the ratio of the stroke to the length of the cylinder is small, and there is thus more room left, while the rope is elongating, for the normal working of the plunger to continue.

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4). As regards the rope itself, the greatest attention must be given to the two extremities, viz. the point below where the rope is attached to the rods and pump, and the part above where the rope is attached to the balancing beam or chain drive.

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EXPERIENCE has shown that these are the parts where the rope wears out most quickly. Unfortunately the part of the rope near the plunger does not as a rule get the benefit of frequent inspections. Consequently most rope breakages take place there. It will

be found furthermore that these breakages happen mostly when the weight ratios have not been correctly established, i. e. when, owing to friction on the cylinder, the speed of the downward stroke of the piston is less than that of the rope.

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IN this case, kinks are formed in the rope immediately above the sinker bars. This means that the protruding part of the rope will wear out quickly against the casing walls. Furthermore, there may be a defect in the construction of the rope, e.g. a twist tendency left in the rope, which causes ratation of the rope in the well. This twist tendency in the rope is not removed by the stress engendered during work, but it can be counteracted to a certain extent by a specially constructed rope socket. For this purpose, a swivel rope socket with ball bearings and shock absorbing springs is recommended.

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THE ball bearings ensure the torsionary adjustment of the rope by free rotation, and the springs lessen the shock arising from the upward movement of the plunger. The main point is, as with all Canadian pumps, that the stroke should be as lon gas possible, and the number of strokes per minute as few as possible. By this means, not only the rope but all the other parts of the utfit, e.g. pump valve springs, ball bearings, etc., are preserved.

The upper end of the rope is of course easier to control.

We refer to the part near the conncetion between the rope and the balancing beam or chain attachment.

✦ ✦ ✦

DIFFICULTIES arise at three points.

I. At the stuffing box.

AS the raison d'ètre for the stuffing box is to stop the passage of gas and oil alongside the rope, theoretically the packing should be 100% tight. With pump rods this is quite easy to attain by the insertion at this point of a polished rod.

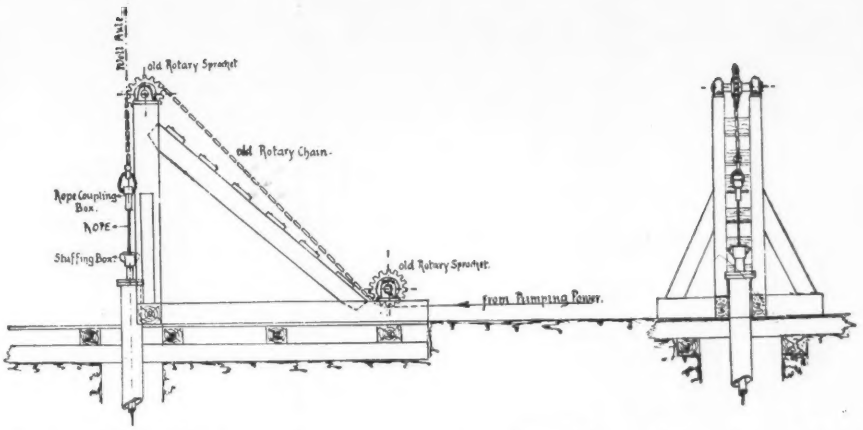

Fig. 4. Chain Attachment.

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HOWEVER, in the case of a wire rope with its unavoidably uneven surface, the possibility of using either hard metal packing or soft leather or hemp packing is excluded, owing to the inevitably rapid wear that would ensue. There is the possibility of obtaining a tighter packing with rubber, or perhaps still better with loose metallic packing, e.g. Ace-O-Pax, which can be made to fit into cavities of any shape. This packing resists hard wear and has proved itself quite suitable for this purpose.

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II. Accurate Centering of the Rope

THE best stuffing boxes and packings are of no use if the rope is not properly centred.

It has been proved that to this end it is better to use the chain attachment rather than the ordinary balancing beam which is so much in vogue in Roumania.

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ON an ordinary wooden or iron frame is fitted a rotary chain wheel seated in a plummer block, and so placed that the longitudinal axis of the bore hole is at an tangent to the chain wheel. By such an accurate guiding of the rope to the exact axial centre of the borehole wear on the rope and packing will be avoided.

With the balancing beam this absolute centering cannot be attained, even with the most accurate erection.

Obviously a pump working from a balancing beam is subjected to a considerable amount of lateral motion.

III. The Other Danger Lies With the Rope Clamps.

THESE are often the cause of rope breakages, or, should the rope be well looked after, to continual rope repairs.

Generally far too little attention is given to the construction and erection of the clamps. One is apt to overlook the fact that the pump rod, which consists of a solid piece of metal, and the rope, which consists of many wires, probably not less than 42, need to be treated very differently. A rod is a solid piece of plant, whilst a rope is a delicate machine.

Owing to faulty construction of the clamps, e.g. metal too hard, or unequal pressure from the screws, very often individual wires are crushed and broken and thus the rope weakened.

Under such conditions the rope will soon collapse.

An example of a rope clamp which will not damage the rope is shown in figure No. 5.

✦ ✦ ✦

4. The rope should be held in a pair of jaws made of hardened rubber, or else very soft bronze.

THE jaws are pressed together by a pair of conical split rings made of spring steel, which bring the two stuffing boxes together by means of screws, and thus the rubber or bronze dies are pressed against the rope. By this arrangement, an absolutely exact closing of the jaws is guaranteed and the possibility of damage to the rope excluded.

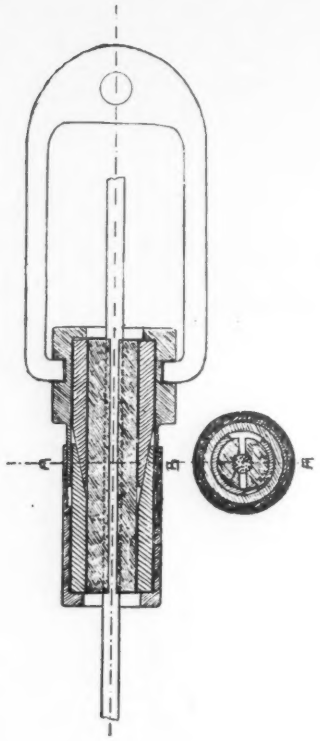

Fig. No. 5. Clamps. ✦ ✦ ✦

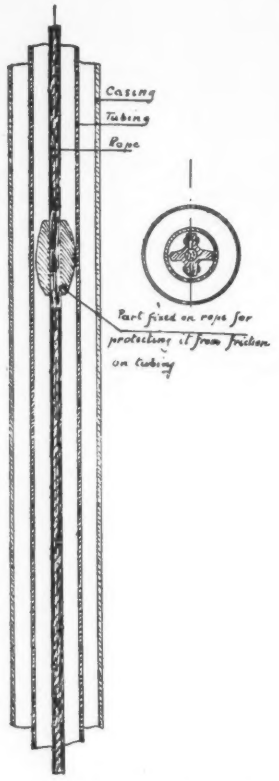

Fig. No. 6. Solid Guide. ✦ ✦ ✦

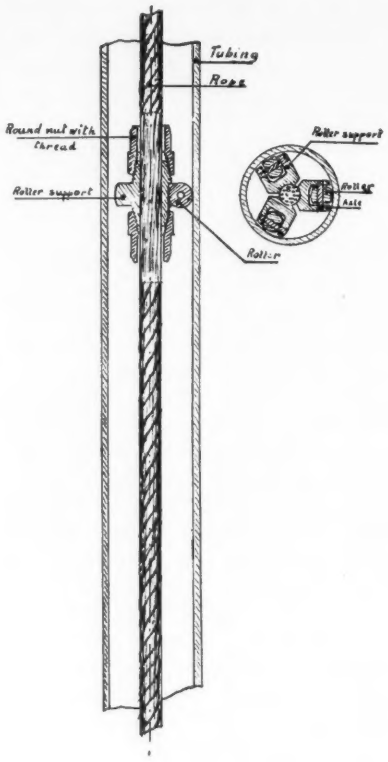

Fig. No. 7. Colrol Guide. ✦ ✦ ✦

5. The last, and a very important requirement, is to lessen the wear on the ropes caused by cutting into the tubing in the case of the crooked wells.

✦ ✦ ✦

WE give here two kinds of apparatuses, which have given good results:

THE first is very simple and consists only of a bronze cross which is clamped on to the rope. This guide however can hardly be used with very crooked holes, as it wears away too quickly, and the bronze dust, which is rubbed off, falls into the well, settling inter alia between the plunger and the cylinder, thus interfering with the working of the pump.

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THE second, the Colrol apparatus, although somewhat more costly, is preferable. It consists of steel **rollers** which revolve with the upward and downward motions of the rope.

The guides are placed on the rope at the parts where the tubing is crooked, and are given more or less play according to circumstances.

OF course it is important to establish exactly where the guides should be placed, and it must be borne in mind that these points may shift from time to time with changes in the condition of the casing.

Generally, cut places are indicated by the plunger getting stuck. Should this be noticed in time, the tubing should be taken out; otherwise the rope will probably break.

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WHEN the rope is taken out of the well the worn parts on the rope will no doubt show clearly where rope guides are required.

These guides can also be used in normal, straight wells, in order to assure exact centering of the rope in the hole.

✦ ✦ ✦

IT may also be pointed out that the saving of time by pumping with rope is particularly noticeable when pumps are not worked by a separate apparatus but from a central pumping rig.

In such cases, to extract and lower the plunger, it is sufficient to put a tripod over the wall, and the haulage of the rope can be done by means of a caterpillar tractor with winding drum.

✦ ✦ ✦

FINALLY we will deal with the construction of the wire rope in the light of the conditions of work elucidated above.

The rope must have the following qualities:

1) **A minimum of elongation tendency**
2) **A minimum of rotating tendency**
3) **Stiffness**
4) **Resistance to abrasion**

✦ ✦ ✦

THHe production of a rope to answer all these requirements has been a problem for the wire rope manufacturer, but certainly great strides have been towards reaching the ideal.

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1). Elongation.

THIS is perhaps the most difficult problem of all, but in the types recently produced, in which there is a minimum of vegetable

(*Please turn to page 33*)

Bolts, Nuts, Washers and Rivets - Production Figures '33

The Census of Manufactures of the U. S. Department of Commerce, Bureau of the Census, reports the production of bolts, nuts, washers and rivets, not made in plants operated in connection with rolling mills, for the year 1933 as shown herewith.

WAGE-EARNER employment in the manufacture of bolts, nuts, washers, and rivets in plants other than those operated in connection with rolling mills increased substantially during the spring and summer of 1933, according to a preliminary report compiled from data collected in the Biennial Census of Manufactures taken in 1934, released today by Director William L. Austin, Bureau of the Census, Department of Commerce. The figures for the final months of the several quarters of the year show 6,636 wage earners on the pay rolls in March, 8,503 in June, 10,806 in September, and 10,010 in December. The figures for September and December, 1933, are larger than those for the corresponding months of 1931 (the last preceding census year).

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THE total value of the production of bolts, nuts, washers, rivets, etc., in 1933, in all industries in which such products are made, amounted to $41,849,994 (at f.o.b. factory prices), a decrease of 16 per cent as compared with $49,845,849 reported for 1931.

✦ ✦ ✦

THIS industry embraces establishments engaged primarily in the manufacture of bolts, nuts, rivets, lock washers, plate washers, riveting burrs, turnbuckles, toggle bolts, etc., and therefore does not cover such plants operated in connection with rolling mills.

✦ ✦ ✦

STATISTICS for 1933, with comparative figures for earlier years, are given in the following tables. All figures for 1933 are preliminary and subject to revision.

Table 1. Shows comparison of last three census reports.

Table 2. Products of all separate plants in the industry, not operated in connection with rolling mills.

Table 1—Summary for the Industry: 1933, 1931 and 1929

	1933	1931	1929
Number of establishments	102	116	117
Wages earned (average for the year) 1/	8,473	10,518	16,175
Wages 2/	$7,159,988	$10,176,837	$22,115,532
Cost of materials, fuel, and purchased electric energy 2/	$15,310,820	$16,872,487	$44,211,785
Products, total value 2/	$32,789,299	$39,483,131	$102,393,099
Bolts, nuts, washers and rivets	$29,163,822	$34,577,788	(3)
Other products (not normally belonging to the industry)	$ 3,625,477	$ 4,905,343	(3)
Value added by manufacture 4/	$17,478,479	$22,610,644	$58,180,314

Census year	March	June	September	December
1933	6,636	8,503	10,806	10,010
1931	11,564	10,791	9,637	9,293

1. Not including salaried officers and employees. Data for such officers and employees will be included in a later report. The item for wage earners is an average of the numbers reported for the several months of the year. In calculating it, equal weight must be given to full-time and part-time wage earners (not reported separately by the manufcaturers), and for this reason it exceeds the number that would have been required to perform the work done in the industry if all wage earners had been continuously employed throughout the year. The quotient obtained by dividing the amout of wages by the average number of wage earners can not, therefore, be accepted as representing the average wage received by full-time wage earners. In making comparisons between the figures for 1933 and those for earlier years, the possibility that the proportion of part-time employment varied from year to year should be taken into account.
2. Profits or losses can not be calculated from the census figures because no data are collected for certain expense items, such as interest, rent, depreciation, taxes, insurance, and advertising.
3. Not reported separately.
4. Value of products less cost of materials, fuel, and purchased electric energy.

Table 2—Wage Earners, By Quarters: 1933 and 1931.

The figure given for the final month of each quarter is the total number of wage earners on the pay rolls for the week including the fifteenth day of the month, or for some other representative week in the month.

Bolts, Nuts, Washers and Rivets—Production, by Class, Quantity and Value, for the United States: 1933.

Table 3

This table covers the production of bolts, nuts, washers and rivets in all industries in which such products are made.

Class	Quantity	Value
Bolts, nuts, washers, rivets, etc, total value		1/ $41,849,994
Made in the Bolts, Nuts, Washers, and Rivets industry		1/ 29,163,822
Made in other industries		1/ 12,686,172
Iron and steel:		
Bolts and nuts		
Quantity reported kegs, (200 pounds)	2,140,585	25,005,233
Quantity not reported		5,671,084
Rivets—		
Quantity reported, kegs (200 pounds)	624,473	4,306,118
Quantity not reported		374,345
Washers—		
Quantity reported, kegs (200 pounds)	127,551	1,799,695
Quantity not reported		1,223,289
Turnbuckles, toggle bolts, etc		1,493,308
Nonferrous bolts, nuts, washers, rivets, etc.		1,493,308
Not reported by kind or quantity		708,089

1. The corresponding figures for 1931 are: Total, $49,845,849; made in the industry, $34,577,788; made in other industries, $15,268,061. The detailed data for 1931 were not collected in such form as to provide statistics comparable with those for 1933.

Sheet Lead Manufacturing

A description of the sheet lead manufacturing plant of the Flemm Lead Company, Inc. Long Island City, N. Y. ✦ ✦ ✦ ✦ ✦ ✦

THE new sheet lead manufacturing plant of the Flemm Lead Company, Inc., of Long Island City, N. Y., which has been under construction for several months, was opened for operation recently. The building and manufacturing equipment are entirely new and, being unhampered by the necessity for utilizing existing facilities, the designers were able to lay out and build a plant in which are incorporated modern features which are believed to make it the most complete and efficient sheet lead mill in existence.

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THE new building, similar in construction to and adjoining the present building, was designed by John M. Baker, Architect, of Long Island City, and is of brick and steel with a floor space 45′ 0″ wide x 175′ 0″ long, and is used entirely for the sheet lead department.

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THE mill equipment was designed and built by the Farrel - Birmingham Company, Inc., of Ansonia, Conn., and will produce sheets of any mixture classed as lead, up to 9′ 0″ wide.

✦ ✦ ✦

THE Flemm Lead Company started its business in January, 1928, and has been manufacturing a line of lead products which are known to the trade as "FLEMCO" products, consisting principally of lead pipe, lead traps and bends, 'Paramount' roof flashings, "Fit-All" cleanout plugs and many other lead specialties. The sheet lead equipment recently installed now puts the Company in a position to manufacture a complete line of lead products.

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Casting Equipment

THE melting pot of 15,000 lbs. capacity, is of special heat resisting cast iron. This pot is supported on the brick work of the combustion chamber. Surrounding the fire brick chamber is an insulating layer of Sil-O-Cel brick with an outer jacket of heavy sheet steel. The pot is oil-fired by Williams Oil-O-Matic burners.

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ADJACENT to the melting pot is the slab mold designed to cast a maximum billet 9′ 0″ x 4′ 0″ x 4″. The mold is made with removable partition so that half size slabs can be made when desired. Piers supporting the mold are constructed to allow space below the mold for gas burners.

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AN "I" beam extends the length of the building over the slab mold and the mill tables and Wright Electric Trolley Hoists working on this "I" beam are used to lift the cast slab from the mold to the mill tables and to handle finished sheets.

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Rolling Mill

TO roll the cast slab into sheets, two chilled iron rolls 28″ diameter by 114″ face are used. These rolls are supported by brass bearings in heavy arch top housings of Meehanite (high strength cast iron). The top roll is counterbalanced and held against the roll adjusting screws by weights.

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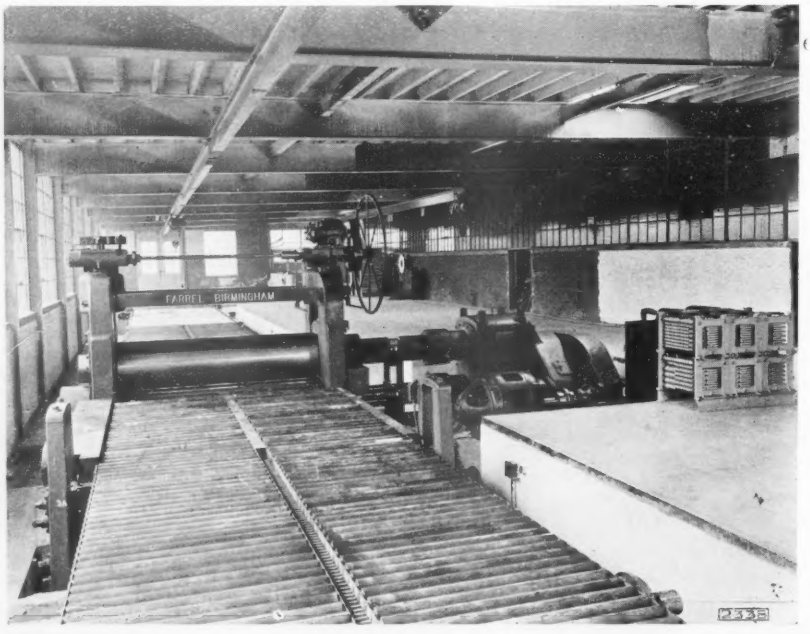
THE slab is reduced to the required thickness by passing it



View of interior of lead mill. ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

back and forth between the rolls, the roll opening being adjusted between passes. A 10 H. P. motor operating through worm gearing and adjusting screws provides for rapid and accurate roll adjustment. The operator can read the roll opening at any time from a drum and pointer built as a part of the roll adjustment mechanism. The motor is provided with a solenoid brake to insure against over-running the desired setting. For fine adjustments of the rolls a manual adjustment is provided.

✦ ✦ ✦

WHILE lead is considered a soft, ductile material, considerable power is required for rolling. A 200 H. P. Westinghouse, wound rotor, A. C. motor is used to drive this mill. With this motor and its control a speed variation of 2 to 1 is obtainable without loss of torque. In order to roll antimonial as well as common lead sheets efficiently, both rolls of the mill are driven. This necessitated a pinion stand in addition to the gear reduction provided between motor and mill. The reduction from motor to mill speed is accomplished through two sets of Farrel-Sykes double helical gears mounted on Timken roller bearings in a heavy cast iron case. The pinion stand is built as an integral part of the gear drive, and the pinions are also the Farrel-Sykes, double helical, continuous tooth type. Between the drive and the mill, standard four-pod type spindles and couplings are used with spring-type spindle carriers.

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Roller Tables

TO support the material and to feed it into and receive it from the mill rolls, tables are required on each side of the mill. These tables are made up of a driven and an idler section on each side of the mill rolls and a finishing or cutting table on one side only. The total length from end to end of tables is about 113′ 0″.

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THE driven sections are similar and extend approximately 14′ 6″ each side of the mill. Each section is made up of 7 driven rolls, 8″ in diameter on 18⅝″ centers, with two 3⅝″ rollers between each pair of 8″ rolls. The tables are about 10′ 0″ wide and provide for center as well as end support for all rollers. All rollers are mounted in anti-friction bearings.

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THE driven rollers must be actuated in correct synchronism with the mill rolls. They must be slowed down when the mill rolls slow down, speed up when the mill speeds up and reverse when the mill reverses. To accomplish this synchronism in the most direct manner, the table rolls are driven from the bottom mill roll through bevel spur gears. All gears are covered and provided with automatic lubrication by dipping in oil.

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THE frames supporting the rollers are made of welded structural and plate steel. Wells for lubrication of the table roller gears are built into the structure.

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ON the entering or furnace side of the mill the idle roll tables extend 25′ 8″ beyond the driven section. On the finishing side of the mill these idle roll tables extend 30′ 3″ beyond the driven section. The rollers of these idle roll sections are 3⅝″ diameter spaced on 5″ centers. The rollers do not extend across the table in one piece. Two rolls each 4′ 8″ are are used to make up the width of the table. Between the rolls extending lengthwise of the table is a rack 2″ pitch, 3″ wide, which provides fulcrum points for a bar when making small movements of heavy pieces of sheet along this table. All rolls are mounted in anti-friction bearings.

✦ ✦ ✦

Finishing Table

THE finishing or cutting table is 28′ 0″ long. This is a maple-topped, structural steel table used for cutting sheets to suit specific requirements as to length and width. At the end is a capstan drum driven by a 5 H. P. geared head motor and along one side moveable idler capstans are provided. These capstans provide means for pulling cutting knives lengthwise of or across the sheet.

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Sheet Cutter

IN general the 4″ thick slab is not reduced to its finished thickness in one piece. After the billet is reduced to a thickness of 1″ or less it is cut into pieces. Each of these pieces is then reduced to the desired finish gauge. To cut the heavy sheet into pieces a sheet cutter is used. This machine is located on the furnace side of the mill between the driven and idle roll table sections.

✦ ✦ ✦

TWO circular cutter disks are mounted on nuts traversed across the sheet by screws. Cutting loads tending to deflect the screws are taken on structural steel members against which the nuts ride. The cuttnig unit, cutters, nuts, screws and beams are carried in substantial Meehanite frames and arranged to be lowered or raised in these frames. When lowered, rollers mounted on top of the cutter unit become a part of the idle roller table. When raised the unit is in position to cut across the sheet. The cutter is driven by a 10 H. P. motor.

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Weighing Equipment

TWO Kron scales are provided for weighing material during process of manufacture and for shipment. These scales are arranged to be operated with an "I" beam monorail and the electric hoists already mentioned.

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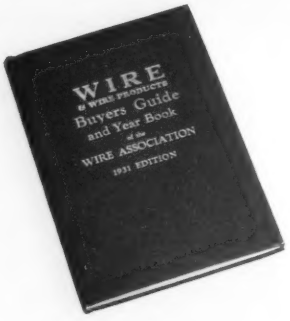
AT two different points in the monorail system 4′ track sections are suspended from an overhead scale lever system which in turn is suspended from a steel superstructure. As the hoists and load are moved on to the live track section the weight is indicated on the scale dial which is pedestal mounted at operating floor level.



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9. Insulating
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11. Spooling
12. Tinning
13. Shaping
14. Forming
15. Screw Machine Products
16. Manufactured Products From Rod
17. Manufactured Products From Wire
18. Insulated Wire or Cable

EXAMPLES OF TYPICAL HEADINGS SHOWING STYLE OF ADVERTISEMENTS AND BOLD FACE LISTINGS

WIRE—Bolt

American Steel & Wire Co., 208 S. La Salle St., Chicago, Ill.
Atlantic Wire Co., Branford, Conn.

Bethlehem Steel Company
BOLT WIRE, NAIL WIRE, RIVET WIRE, STAPLE WIRE
Bethlehem, Pa.

BETHLEHEM STEEL CO., Bethlehem, Pa.
CONTINENTAL STEEL CORP., Kokomo, Ind.
JONES & LAUGHLIN STEEL CORP., 3rd & Ross Sts., Pittsburgh, Pa.

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Wide range of grades and finishes, for cold forming of cap screws, bolts, rivets, etc.
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JONES & LAUGHLIN BUILDING, PITTSBURGH, PENNSYLVANIA

KEYSTONE STEEL & WIRE CO., 3000 Industrial St., Peoria, Ill.
Pittsburgh Steel Co., Union Trust Bldg., Pittsburgh, Pa.
REPUBLIC STEEL CORP., Republic Bldg., Youngstown, O.
Seneca Wire & Mfg. Co., Fostoria, O.
YOUNGSTOWN SHEET & TUBE CO., Youngstown, O.

MACHINERY—Rolling Strip, Cold Iron & Steel

BRODEN CONSTRUCTION CO., 10255 Harvard Ave., Cleveland, O.
Conran, Fred'k M., 107 Colden St., Newark, N. J.
FARREL-BIRMINGHAM CO., INC., 37 Main St., Ansonia, Conn.

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Outstanding Personalities of the Wire Industry

Duriron Company Announces Promotions

WM. E. Hall, President of **The Duriron Company, Inc.,** of Dayton, Ohio, has announced the appointment of **M. L. Bettcher,** formerly General Superintendent, to the position of General Manager, succeeding **Dudley H. Miller,** who becomes Executive Vice-President.

✦ ✦ ✦

MR. Bettcher is a graduate Mechanical Engineer of New York University. He joined the Duriron organization in January of 1920 shortly after being discharged from the Army. He served overseas as an officer in the 309th Engineers. He started his work with The Duriron Company as a salesman in the Chicago District and later was transferred to the Manufacturing Department at the Plant and General Offices in Dayton.

✦ ✦ ✦

N. **E. Philpot,** who has been manager of the Chicago Office for several years, is assuming charge of the New York Office, succeeding W. E. Pratt, resigned. **Col. M. W. Smith,** formerly manager at Buffalo, is taking over the Chicago Office.

✦ ✦ ✦

W. A. Watkins, has been transferred from the General Sales Department at Dayton to Buffalo as manager.

✦ ✦ ✦

Fredolf J. Peterson Dies

MR. **Fredolf J. Peterson,** Detroit district representative of The Electric Furnace Company, Salem, Ohio, died at his home, 2947 Calvert Ave., Detroit, Mich., Sunday morning, after a brief illness of pneumonia.

✦ ✦ ✦

MR. Peterson, who was born in Sweden, was 49 years of age and came to this country when 17 years old. He has been associated with The Electric Furnace Company for the past 15 years, 12 years of which he represented the Company in the Detroit district. He was a member of the Detroit chapter of the American Society for Metals and was also a member of all Masonic bodies including the Shrine. His wife and three sisters survive.

M. L. BETTCHER
General Manager
The Duriron Company

✦ ✦ ✦

Stromberg-Carlson Personnel Changes

WESLEY M. Angle, vice-president of the Stromberg-Carlson Telephone Manufacturing Company, has been elected president of the company. He succeeds the late W. Roy McCanne who died November 5th. George A. Scoville has been named vice-president and general manager.

Mr. Angle became identified with the Stromberg-Carlson company after his graduation from Harvard University in 1903. In 1907 he was appointed assistant secretary and later became assistant treasurer. He was elected a member of the board of directors and named secretary in 1914 and in 1924 was appointed vice-president.

✦ ✦ ✦

MR. Scoville, who was general manager, will have charge of sales, advertising, engineering and production. He completed the electrical engineering course at Stanford University and entered the employ of the Western Electric Company in 1903. Later he became sales manager and engineer of the Dean Electric Company and its successors the Garford Manufacturing Company, Elyria, Ohio, In 1916 he joined the Stromberg-Carlson Company as sales manager, becoming a director in 1920, vice-president in 1924.

✦ ✦ ✦

James H. Shilling, Supt. Youngstown Sheet & Tube Co.

JAMES H. Shilling has been appointed superintendent of the rod and wire department of the Youngstown Sheet & Tube Company. He succeeds the late F. W. Nullmeyer. Mr. Shilling was formerly assistant superintent.

✦ ✦ ✦

Charles B. Jacobs of American Brass Co.

CHARLES B. JACOBS, 64, metallurgist and inventor at the American Brass Company, Waterbury, died at the Waterbury Hospital of pneumonia on October 18. Mr. Jacobs, prior to his association with the American Brass Company, had worked with such noted scientists as Steinmetz and Pupin and had secured numerous patents of metal process materials. He was the inventor of "Evadura" and "Alundum" metal and for the latter work receiving the John Scott medal in 1914 from the Franklin Institute of Philadelphia. He was also awarded the silver medal at the Louisiana Purchase Exposition in 1904.

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COMPANIES with which he was connected prior to his association with the Waterbury company were: The Norton Company, Worcester, Mass.; the General Electric Company, Schenectady; Crocker and Wheeler Company and the duPont Company. He also had his own laboratory in New York for a number of years.

✦ ✦ ✦

Heart Attack Kills Steel Co. Executive

RUSSELL L. DAVIS, 52, general superintendent of the Cleveland plant of the Otis Steel Co. and a nationally known steel man, died suddenly of a heart attack at his home, 13016 Bechwood Avenue S. E.

✦ ✦ ✦

MR. DAVIS was a lifelong resident of Newburg and had

(*Please turn to page 44*)

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in Oct. 1934 and Oct. 1933
(In gross tons)

	Oct. 1934	Sept. 1934	Oct. 1933
Wire rods	483	1,293	2,645
Hoops, bands and strip steel	1,646	1,079	1,424
Plain black or galvanized iron or steel wire	2,988	3,237	3,720
Barbed wire and woven wire fencing	3,117	2,779	2,661
Woven wire screen cloth	56	164	74
Wire rope	257	219	258
Insulated iron or steel wire and cable—see analysis below			
Other wire and manufactures	286	444	357
Wire nails	887	875	832
Tacks	34	39	25
Other nails, including staples	261	241	270
Bolts, machine screws, nuts, rivets and washers	394	450	560
Total, these 11 classifications	10,409	10,820	12,526

Imports of Iron and Steel wire Products Into The United States
(In gross tons)

Concrete reinforcement bars	17	161	85
Hollow bars and drill steel	60	150	71
Merchant steel bars	1,456	1,507	2,178
Wire rods	231	339	1,735
Barbed wire	365	533	311
Round iron and steel wire	159	138	261
Telephone and telegraph wire	....	....	....
Flat wire and strip steel	151	178	210
Wire rope and strand	213	139	103
Other wire	62	34	77
Hoops and bands	1,739	1,477	2,351
Nails, tacks and staples	367	599	696
Bolts, nuts and rivets	19	8	41
Total, these 13 classifications	4,839	5,263	8,119

THE 220,209 gross tons of iron and steel products exported from the United States during October declined abruptly by 81,121 tons from the September peak of 301,330 tons— a 26.6 percent loss —and checked the continued upward trend evident over the past three months.

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IMPORTS during October—20,202 tons—represented the smallest tonnage since the year's low of 17,676 tons received during August, and dropped 3,645 tons under the tonnage for the previous month —15.2 percent—and also represented a decrease of 56.7 percent under the total receipts in the corresponding month of last year. The further decline in pig iron receipts—which dropped 5,608 tons under the earlier month—alone was more than sufficient to turn the import trend downward.

✦ ✦ ✦

JAPAN continued to be the chief individual purchaser on a tonnage basis, taking 115,400 tons, retaining its position despite the fact that this was a decline of 52,942 tons from the earlier month's total. This trade included 110,728 tons of scrap—a sharp decline from the record 161,401 tons shipped to that country last month, 2,957 tons of tin plate, 546 tons of black steel sheets, 522 tons of ingots, blooms, billets, slabs, and sheet bars, and 194 tons of 'other plate'. Italy's purchases of 18,585 tons were practically all scrap, which totaled 18,021 tons, the other item of importance being black steel sheets, 528 tons. Canada was the third market of importance, its total of 17,403 tons including 4,431 tons of ingots, blooms, billets, slabs and sheet bars, 2,724 tons of scrap, 2,615 tons of skelp, 2,072 tons of plain shapes, 962 tons of black steel sheets, 748 tons of steel bars and 541 tons of cold rolled strip steel. Mexico assumed fourth position in the purchase of iron and steel products from the United States during October, taking 9,829 tons, composed chiefly of 2,463 tons of scrap, 1,995 tons of black steel sheets, 1,410 tons of tin plate, 562 tons of galvanized steel sheets, and 432 tons of barbed wire. The fifth market was Argentina with a total of 5,974 tons, of which the greater part was made up of 3,050 tons of tin plate, 691 tons of galvanized wire, 594 tons of barbed wire, 469 tons of cast-iron soil pipe and fittings, and 353 tons of seamless casing and oil-line pipe. The United Kingdom—by virtue of scrap purchases aggregating 5,319 tons—was the sixth market of prominence with total purchases of 5,819 tons including, in addition to scrap, 154 tons of hoops, bands, and scrolls, 132 tons of cold rolled strip steel, and 77 tons of black steel sheets.

✦ ✦ ✦

BELGIUM assumed the lead in the supply of iron and steel products to the United States during October—with a total of 5,524 tons accounting for 27.3 percent of the aggregate received—supplanting the Netherlands, which dropped back to seventh position. Included in this total were 2,148 tons of structural shapes, 1,533 tons of hoops and bands, 908 tons of merchant and other steel bars, and 112 tons of nails, tacks and staples. Canada ranked second with a total of 3,767 tons—18.6 percent—made up chiefly of 1,965 tons of scrap, 1,012 tons of ferromanganese and spiegeleisen, 462 tons of rails and rail fastenings, 132 tons of welded pipe, and 112 tons of pig iron, followed by Czechoslovakia, whose 3,502 tons was 17.3 percent of the total and included 3,500 tons of pig iron. British India with 2,527 tons —entirely composed of pig iron— was the next important supplier and participated in the total trade to the extent of 12.5 percent. Germany was the fifth supplier of the month with a total of 1,862 tons—9.2 percent—composed chiefly of merchant and other steel bars, 363 tons, nails, tacks, and staples, 237 tons, 'other pipe', 233 tons, structural shapes, 328 tons, barbed wire, 226 tons, and wire rope and strand, 158 tons.

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CARD clothing imports took an upward climb the 8,967 square feet valued at $14,057—all supplied by the United Kingdom — registering 2,211 square feet and $3,322 more than those received during the earlier month.

(*Please turn to page 30*)

A Review of Recent Wire Patents

No. 1,979,919, MACHINE FOR ROLLING SCREW THREADS, Patented November 6, 1934, by Glenn H. Wayne, Waterbury, Conn., assignor to Scovill Manufacturing Company, Waterbury, Conn., a corporation of Connecticut.

This is described as an improvement upon the inventor's machine disclosed in U. S. patent 1,524,327, the machine being improved so that it may be employed for rolling of small-size screws.

✦ ✦ ✦

No. 1,980,153, REEL. Patented November 6, 1934 by Walter G. Brown, Uxbridge, and George A. Gleason, Worcester, Mass., assignors to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

For the purpose of eliminating the expense of arbor hole flanges to reels containing wire, these inventors provide bolts or the like in place of the flanges.

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No. 1,980,320, CABLE. Patented November 13, 1934 by Philip H. Chase, Bala-Cynwyd, Pa.

Expansion tubes are provided in this cable, with spacing means for the purpose of relieving the tubes against mechanical pressure during manufacture, insulation and use.

✦ ✦ ✦

No. 1,980,363, METHOD OF MAKING ELECTRICAL CONDUCTORS. Patented November 13, 1934, by Horace A. Staples, Plainfield, N. J., assignor to Phelps Dodge Copper Products Corporation, New York, N. Y., a corporation of New York.

The method of making high voltage electrical conductors, as set out by this inventor, is forming strips of a thickness approximately 1/10 of the desired diameter of the finished wire into an open seam tube of indefinite length, and then

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 17 East 42nd St., New York.

submitting the tube to successive drawing operations without internal support.

✦ ✦ ✦

No. 1,980,387, ELECTRIC CABLE Patented November 13, 1934 by William A. Del Mar, Greenwich, Conn., assignor to Habirshaw Cable and Wire Corporation, New York, N. Y., a corporation of New York.

Fillers or laterals are provided for the interstices of this cable, these fillers comprising a plastic compound, the major portion of which comprises factice, with a binder around the compound and the wire conductors.

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No. 1,980,388, OIL FILLED CABLE WITH TUBULAR OIL CHANNELS. Patented November 13, 1934, by William A. Del Mar, Greenwich, Conn., assignor to Habirshaw Cable and Wire Corporation, New York, N. Y., a corporation of New York.

In the construction of this cable, it is provided with oil channels outside of the insulation. The construction includes a wire conductor enclosed in oil-impregnated paper and an oil pervious metallic shield, with a lead sheath and longitudinally split oil ducts open to the impregnating oil stranded around and encircling the shield and beneath the sheath.

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No. 1,981,083, WIRE ROPE AND CABLE MAKING MACHINE. Patented November 20, 1934, by William E. Somerville, Coal City, Illinois.

Provision is made for feeding the wire rope or cable to the reel and for balancing the feeding mechanism to prevent unbalancing by the weight of the rope and the feeding or guiding means.

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No. 1,981,878, LAMP, FILAMENT, AND PROCESS OF MAKING THE SAME. Patented November 27, 1934, by Samuel Ruben, New Rochelle, N. Y., assignor to Sirian Lamp Company, Newark, N. J., a corporation of Delaware.

The filament consists of molybdenum metal having a coating of beryllium and molybdenum mixture and an oxide of beryllium.

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No. 1,982,426, TRIPLE LOCK SPRING WITH FLOATING TOP. Patented November 27, 1934, by Otto L. Goethel, Grand Rapids, Mich.

This spring is particularly applicable for use in the construction of upholstered cushions, seats and the like. The spring has outwardly bowed portions in the two upper convolutions, these convolutions normally being in spaced relationship due to the resiliency of the spring. From this point the wire forming the spring is extended inwardly towards the central portion of the coil, then laterally to form a loop portion and then outwardly with respect to the axis of the coil, the extending portions being above the upper convolution in the plane of the end of the spring so as to form a floating portion.

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No. 1,982,539, INSULATED ELECTRICAL CONDUCTOR. Patented November 27, 1934, by Beauford H. Reeves, New Haven, Conn., assignor to Rockbestos Products Corporation, New Haven, Conn.

This electrical conductor has an insulating covering containing urea in a condition to produce ammonia gas upon heating.

Exports And Imports

(*Continued from page 29*)

THE downward trend continued in receipts of wire cloth and screening, the 48,994 square feet imported dropping 13,658 square feet under September receipts which was likewise under August figures. The October total was supplied by Germany, 29,481 square feet, Canada, 10,395 square feet, France, 6,752 square feet, and the Netherlands, 685 square feet.

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THERE were no imports of wire fencing and netting galvanized before weaving during October contrasted with the 652,000 square feet received during the previous month. A sharp drop of 425,250 square feet was recorded in receipts of that galvanized after weaving, the Netherlands accounting for the total of 240,750 square feet received.

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THE 31,106 square feet of fourdrinier and other papermaking wires received was 5,331 square feet under the earlier month and was supplied by Austria, 21,820 square feet, France, 4,765 square feet, and Germany, 4,521 square feet.

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A VERY slight increase occurred in wire heddle receipts, the 26,000 pieces—all from France—being 1,000 pieces more than received during September.

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EXPORTS of iron and steel wood screws during October, 1934 totalled 21,470 gross, valued at $2,405. Of this total Colombia took 5,746 gross, valued at $636; Mexico 4,995 gross valued at $366; Cuba 4,803 gross valued at $560; the Philippine Islands 2,675 gross valued at $216.

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EXPORTS of brass wood screws during the same period totalled 2,251 gross, valued at $962. Of this amount Panama took 757 gross, valued at $423; Cuba 487 gross valued at $127; Mexico 286 gross valued at $61; United Kingdom 174 gross valued at $131; Venezuela 140 gross valued at $63.

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IMPORTS of wood screws during the same period amounted to 17,550 gross, valued at $1,647, with Sweden supplying 10,070 gross valued at $904; Germany 6,230 gross valued at $482; and the Netherlands 1,250 gross valued at $261.

'Round the World With the Wire Industry

Latvia Rejects Applications for Dimensioned Iron and Steel Imports

ACCORDING to the official Government Gazette of Latvia, all applications for importation of dimensioned iron and steel, as well as of iron and steel wire, during the fourth quarter of the present year have been rejected by the Currency Commission.

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Additional Products Made Subject to Quota in Rumania

BY a decree of September 10, published in Monitorul Official of September 19, among other things, bolts, screws, rivets, etc., have been made subject to import permit requirements and quota restrictions on importation into Rumania.

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British Steel Producers Again Request Higher Duties

BRITISH iron and steel manufacturers are now urging the Import Duties Advisory Committee to recommend increased duties on bars and rods, angles, shapes and sections, whether fabricated or not, and hoop and strip steel, with a few exceptions. The steel industry is divided in its opinion as to the merits of the current application.

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Extension of British Drawback on Certain Stainless Steel Slabs

THE drawback of L15 per ton on slabs of stainless steel of austenitic (18/8) quality used in the manufacture of stainless steel sheets from 3 to 26 Standard Wire Gauge, inclusive in thickness, imported into the United Kingdom from October 9, 1933, for a period of one year, has been extended indefinitely effective October 9.

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New Steel Mill for Bombay

THE Japanese firm of Mitsui Bussan Kaisha Ltd., Bombay, India, in partnership with an Indian (Hindu), is erecting a steel works at Wadala, Bombay, to be known as The Eastern Iron Works, Ltd., Wadala, with the nominal capital to be 30,000 rupees.

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Increase in British Duties on Wire Manufactures

EFFECTIVE October 31, imports into the United Kingdom, wholly or mainly of wire of any section, with specified exceptions, will be subject to an aggregate duty in order to make the rates on manufactures of iron or steel wire conform more closely to the rate on wire.

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Increase in Business of Canadian Firm

PAGE-HERSEY Tubes Limited, Welland, Ontario, Canada, is reported to have had a considerable increase in business so far this year as compared with 1933 with a strong demand for their products from Australia, New Zealand, and the British Isles. It is stated that the recently completed seamless tube mill of the company has increased the efficiency 30 percent, while 500 men are now employed.

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Czechoslovakian Steel Cable Industry

INFORMATION from Prague, reveals that all kinds of steel cables, including those for general and special purposes, are turned out in Czechoslovakia in more than sufficient quantities to cover the domestic consumption. The estimated annual consumption is placed at some 2,500 metric tons, and over the past two years factories have been operating at reduced capacity.

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Flat Woven Wire of the Chain Link Style Extensively Manufactured in the Netherlands

IT is reported that square flat woven wire of the chain link style is extensively manufactured in the Netherlands. The United States participation in the import business of this product is small and in 1933 amounted to 2.3 metric tons valued 1,662 guilders. On the other hand, the Netherlands exported to the United States in last year 582 metric tons valued at 88,213 guilders.

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Manchester Workmen Sue To End U. S. Efficiency

FIVE workmen employed by the Manchester Wire Works recently applied to Chancery Court in London for an injunction to restrain their employers from using American efficiency experts.

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THEY set forth that the experts had sought to speed "the ancient and noble craft of wire-drawing . . . standing above us with notebooks and stopwatches, almost breathing down our necks." The workmen alleged that these methods constituted a breach of contract.

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India Orders German Machinery

THE only Indian steel works, "The Indian Steel & Wire Products" of Tatanagar has ordered a wire and wire rod producing plant from the Krupp works which has been built to special requirements. A capacity of 6,000 tons annually and negotiations are pending which concern a further order for the same plant of double the capacity. The works are in operation at Tatanagar and are using Indian made billets of raw materials.

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IWECO Notes

THE German wire industry is demanding a higher percentage of allotment inside the IWECO. The German wire industry points out that most of the barter business, which has been booked during the past months, must be regarded as "additional" business, which had been booked in face of a keen outsider competition and a keen Japanese and American competition. Without offering foreign buyers some facilities for the sale of their national raw materials in Germany, the orders would not have gone to Germany but elsewhere. Therefore this business is chiefly "additional" and should be placed out-

'Round the World With the Wire Industry

side the particular quota-part of the German wire industry.

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German Exports Increase

THE wire export business has recently greatly improved in quantity, not in values. China, usually buying in Japan, was unable to buy there as well as most of the other Far Eastern markets in Japan and has been forced to buy in Europe. It is expected that the Japanese wire industry will not regain her power of competition, damaged by the Taifun disaster, before the end of this year, and up to this period all orders are going to the IWECO. But South Africa, Brazil and other markets have also been buying heavily. Business with South Africa has not been so good in many years as in the past weeks. Concessions as regards prices had, however to be made in numerous cases.

THE first wire and wire nail factory was opened at Beirut Syria, French Mandate producing 2400 tons of wire nails and fencing wire for the local Syrian market which will become independent of imports. Machinery was supplied by Germany.

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POLISH outside competition on the wire rod market is still continuing and is getting keener from month to month. Though the actual export capacity is not exceeding 600-700 tons monthly, the circumstances, that this quantity is offered at prices which are much lower than the cartel quotation, is influencing the market sharply. As a whole the export demand for wire rods is satisfactory.

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German Freight Concessions to Wire Industry

THE German Railways have granted another freight concession to the wire industry. Export freight rates are already 35-40% lower than ordinary Inland freight rates (if the goods are sent for shipment to any German seaport). Now the following further reductions have been announced. If a single Company supplied 73,-000 tons of wire rods or wire products annually to a German seaport, a discount of 10% is given. On shipments of between 81,000 tons and 90,000 tons and above, 20% on the already reduced freight rates. This reduction is also granted when various makers ship their products confined through a forwarding agent.

Reels And Spools Standardization

Reprints of the report of this committee as published in the November, 1934, issue of WIRE & WIRE PRODUCTS, outlining the proposed new standards for reels and spools for insulated wire and cable can be obtained for 25c a copy.

THE DETAILED DISCUSSIONS

At The

WIRE ASSOCIATION MEETINGS

Held At New York, October 1-5, 1934

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RICHARD E. BROWN, Secretary

THE WIRE ASSOCIATION 17 E. 42nd St., New York, N. Y.

The Development of Wire Rope Pumping

(*Continued from page 22*)

fibre, elongation has been reduced enormously.

✦ ✦ ✦

THERE is the multi-strand rope, called Nuflex or Non-Twist made entirely of wire, but its use has not been found altogether satisfactory.

2. Non-rotation,

This can be obtained partly by:

a. Preformation,

or

b. By the creation of the aforementioned multistrand rope with layers or strands laid in opposite directions.

3. Stiffness.

This can be obtained by the reduction of the quantity of vegetable fibre in the rope, and the use of English or Swedish Acid Steel Wire in large diameters.

4. Resistance to abrasion.

For this purpose English or Swedish Acid Steel Wire of large diameter is the best answer.

IN conclusion we may mention that, where there are good will and intelligent interest, pumping with wire rope in place of rods will save money and time.

SEND IN YOUR LISTINGS FOR THE 1935 EDITION OF THE ANNUAL WIRE BUYERS GUIDE AND YEAR BOOK OF THE WIRE ASSOCIATION

There is no charge for listing your products under any standard heading. ✦ ✦ ✦ ✦ ✦

Standards Available For Wire, Cables and Insulators

THE American Standards Association announces the following Standards available on Wires, Cables and Insulators:

C8a-1932 — Definitions and General Standards of Wires and Cables. AIEE 30-1932.

C8b1-1928—Tinned Soft or Annealed Copper Wire for Rubber Insulation, Specifications for. (Also pub. as H16-1928). AIEE 60, 60-1928. ASTM B33-21.

C8b2-1928—Soft or Annealed Copper Wire, Specifications for. (Also pub. as He-1928). AIEE 60, 61-1928. ASTM B3-27.

C8d1-1928—30% Rubber Insulation for Wire and Cable for General Purposes, Specifications for AIEE 63-1298.

C8j1-1928 — Cotton Covered Round Copper Magnet Wire, Specifications for AIEE 68-1928.

C8j2-1928—Silk Covered Round Copper Magnet Wire, Specifications for AIEE 70-1929.

C8j3-1928 — Enameled Round Copper Magnet Wire, Specifications for AIEE 71-1928.

C8k1-1932 — Weatherproof (Weather Resisting) Wires and Cables. AIEE 72-1932.

C8k2-1932 — Heat Resisting Wires and Cables. AIEE 73-1932.

C8.10-1933—Impregnated Paper Insulation for Lead Covered Power Cables (mimeographed).

C8.11-1933—Code Rubber Insulation for Wire and Cable for General Purposes, Specifications for (mimeographed).

C28a-1930 — Insulator Tests. AIEE 41-1930.

MICROMETER PRECISION MICRO-WELD ELECTRIC WELDERS

Trade Mark Reg. U. S. Pat. Off.

Performance Counts

THE steadily increasing use of Micro Welders by wire manufacturing and fabricating plants everywhere is convincing evidence of their satisfactory performance in actual use.

YOU can depend on Micro Welders to do a consistently high grade welding job under all conditions . . . even continuous hard service at high speed . . . And the patented indexed dials, found only on Micro Welders, assure rapid, precise adjustments.

Micro General Purpose Butt Welder

FOR efficient, high speed, accurate butt welding of wire and rods in a wide range of sizes, you will find the Micro Model "T" the right machine for your needs. It successfully welds round stock from ⅛" to ⅝" in diameter, and other shapes of approximately the same cross section.

✦ ✦ ✦

THE Model "T" has special control features for maintaining close accuracy over long periods of heavy duty service, including the Micro dial which greatly simplifies the work of setting proper spacing and spring tension—thus reducing loading and unloading time to a minimum.

✦ ✦ ✦

THIS Micro Welder is giving outstanding satisfaction wherever in service—you can always depend on the speed, accuracy and efficiency of Micro Welders.

✦ ✦ ✦

Micro Model "T"

Write us in detail about your welding problems . . . we'll be glad to help you solve them the Micro-Weld way.

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Phone State 7408
CHICAGO, ILL.

MICRO PRODUCTS COMPANY

Factory and General Office
PEORIA, ILL.

THE WIRE ASSOCIATION—

What It Will Do For YOU—

THROUGH membership in the Association you will be able to exchange ideas with the best minds in the industry; you will be able to have puzzling technical questions on production answered for you; you will receive the benefits of the research work conducted by the Association for its members.

✦ ✦ ✦

YOU will be kept in touch with all the latest developments of the industry and you will secure personal contact with others with whom you can interchange ideas for mutual benefit.

For Detailed Information Address

Richard E. Brown, Secretary,
17 E. 42nd St.,
New York, N. Y.

Bonus Figures Can Lie

(*Continued from page 13*)

ency is just as important as the labor efficiency. Generally a study of the requirements of the product and of the characteristics of the machine produces a set of standard machine times per unit. These are added to the labor standards, and the sum is the total time allowed.

✦ ✦ ✦

THESE efficiencies are also figured weekly on the same form along with the labor efficiencies. They are scrutinized with the same care as labor efficiencies. Too low an end efficiency on an expensive machine might yield a low labor cost and a satisfactory bonus but increase the total cost by running up the burden per unit.

Weekly Report of Bonus Operators

A LIST of the essential figures from the individual production record sheets is compiled into a "weekly report of bonus operators" (Figure 2). The operators are listed in order of their labor efficiencies, and group totals for each operator are figured. These sheets are forwarded to the department foremen and posted as soon as they have been computed and checked.

✦ ✦ ✦

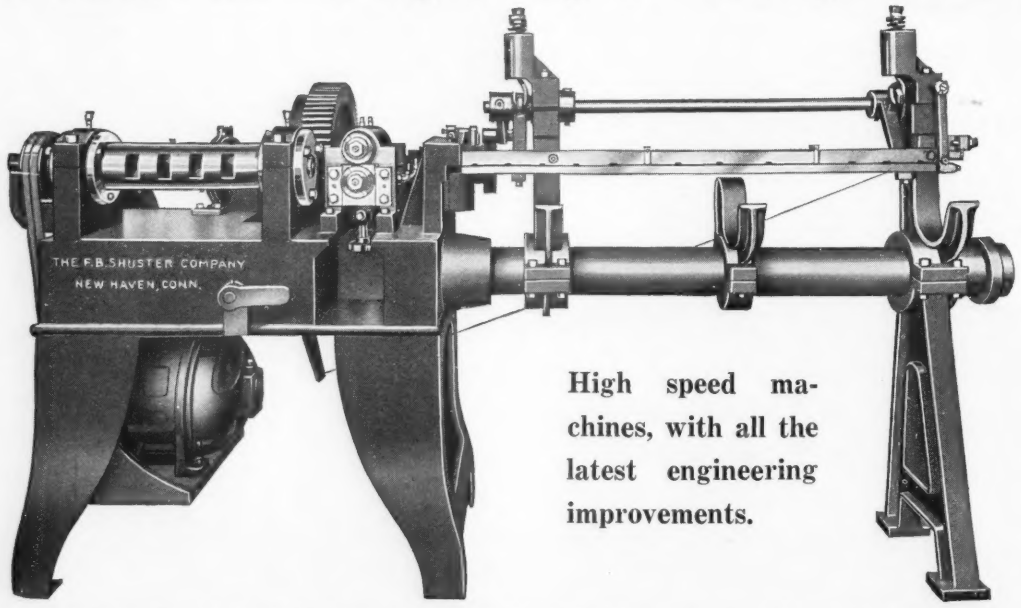
SINCE bonus cannot be paid until some time after it is earned, prompt posting helps shorten the time between performance and reward. The method of listing introduces an element of competition.

✦ ✦ ✦

A CARBON copy of the left-hand side gives the payroll department the figures it requires.

SHUSTER

Automatic Wire Straightening and Cutting Machines



High speed machines, with all the latest engineering improvements.

THE F. B. SHUSTER COMPANY, New Haven, Conn.

Straightener Specialists Since 1866

The group totals show the foremen and the management the picture as a whole.

✦ ✦ ✦

The Control Sheet

THE group totals are posted on a control sheet, shown in figure 3, which also carries totals for previous periods and charts. Weekly inspection of these enables management to watch changes and trends of any importance and to take whatever action is necessary.

✦ ✦ ✦

STANDARD costs are a simple by-product. The labor standards and efficiencies plus the labor rates give the labor cost per unit. The end standards and efficiencies plus the machine-hour burden rates give the burden. The sum of the two is the standard cost for normal operation.

CONTROL SHEET

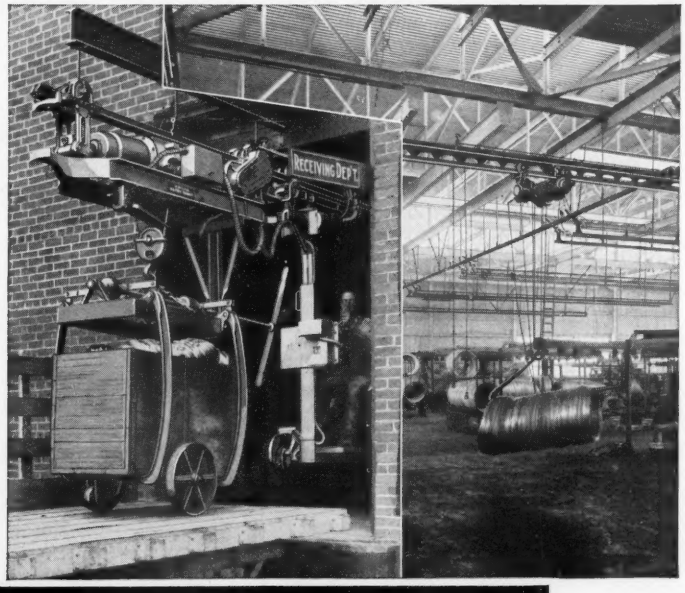
BONUS RATE 1 FOR 1 % ON $25.00 _____ SYM. _____
30 % L
OPERATION

GREEN: GREATER THAN 55 % L EFF'Y

RED: LESS THAN 45 % L EFF'Y _____ HALF 19__

CHANGES IN RATE OR PRACTICE	WEEK END'G	BONUS		HOURS	EFFICIENCY		MACHINE HOURS			T. A. HOURS		PRODUCTION IN _____ FF.
		$	%	T. T.	L. M	L	LOST	IDLE	NET	L. M	L	
PREVIOUS HALF YR. AVG.												
PREVIOUS QTR. AVG.												
QUARTERLY AVG												
QUARTERLY AVG.												
HALF YEAR AVERAGE												

Fig. 3. Weekly inspection of the control sheets on which group totals are posted enables management to watch changes and trends of any importance and to take whatever action may be necessary. ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦



REDUCE
Idle Machine Time

- Have raw material or semi-processed parts delivered to the production machines just as fast as required — then remove the finished job just as quickly — no idle time waiting for stock or congested floors waiting for removal of product.
- Whether your loads are 3 pounds or 3 tons, your service requirements demand intermittent hand operated units or high speed constant duty, electrically operated or automatically controlled, units. Cleveland Tramrail can serve *you*.

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Hand or Electric
Overhead Materials
Transportation Equipment

CLEVELAND TRAMRAIL
Division of
THE CLEVELAND CRANE & ENGINEERING CO.
WICKLIFFE OHIO

Die Association Shows Progress

By Richard E. Brown

IN response to an invitation from the **Association of Wire, Rod and Tube Die Manufacturers Inc.,** I attended their monthly luncheon meeting on December 17, 1934. If the N. I. R. A. has done nothing else it has brought together for the first time in the history of die making, most of the die concerns in the country, to the great benefit of their own industry and wire drawing.

✦ ✦ ✦

I HAD expected to be confronted with a group of warring individualists, each standing pat for his point of view, sullen in his persistence that no secret of his own particular method of making a die would escape his lips, cocksure and egotistical that with his retirement from the industry all knowledge of die manufacture would be forever obscure. You will appreciate how surprised and pleased I was when I learned that the group has made real progress and that the consumers of dies are given paramount consideration at all times. There has for instance been no attempt at price control. Quality and standardization have been and are the immediate problem. They are doing their best to raise the level of the industry to get those border line manufacturers whose standards have been low, to raise the level of their product and business ethics or get out of the die business.

✦ ✦ ✦

DIAMOND dies for the time being are the big problem. The members of the Association have pledged themselves to maintain the highest standards of quality and business ethics. What has concerned them is the fact that the customer has a tendency to shop for diamond dies rather than to place his business with concerns of stability and reputation. They use quite aptly, the illustration of a man wishing to buy a first class engagement ring for his best girl, passing up Tiffany, Black Starr & Frost, Cartier, Grogan, Biddle, etc. to go down some back alley and buy an expensive diamond at a low rate. Neither he nor his friends are competent to judge the quality of the product he gets. Never until he has taken the diamond ring so bought, to one of the above mentioned firms for appraisal and had his purchase confirmed by

THE ASSOCIATION
OF
WIRE, ROD AND TUBE DIE
MANUFACTURERS, Inc.
WISHES THE INDUSTRY
A
Very Successful and Prosperous New Year

✦ ✦ ✦

ATLAS WIRE DIE COMPANY
BALLOFFET DIAMOND WIRE DIE CO.
COCHAUD WIRE DIE CORPORATION
DELAGE-LUHRS
DRIVER HARRIS COMPANY
F. KRAUSE & CO., INC.
J. K. SMIT & SONS, INC.

MEMBERS
NRA MEMBER U.S.
CODE
WIRE, ROD & TUBE DIE
REGISTRATION No. 31-6 1934

✦ ✦ ✦

STANDARD DIAMOND TOOL CO.
TRIANGLE WIRE DIE COMPANY
UNION WIRE DIE CORPORATION
VIANNEY WIRE DIE WORKS
WATERBURY WIRE DIE COMPANY
WAYNE WIRE DIE COMPANY

17 EAST 42nd STREET NEW YORK, N. Y.

them as to quality and value, does he really feel satisfied that he got what he paid for.

✦ ✦ ✦

THE difference in cost between the product of the standard reputable manufacturer and the fly-by-night concern is so small that the Die Association believes no wise manufacturer can afford to gamble. Buying poor merchandise from anybody tends to lower the user's regard for the industry. For that reason the Association is particularly anxious to see that the diamond dies manufactured by any of their group are of the best quality, commensurate with the price paid and the use for which the die is to be put.

✦ ✦ ✦

I BELIEVE we are going to come to respect this group because they are so earnest in their desire to do a good job. They welcome grievances from the Industry and any unethical or shady practices will be summarily dealt with on receipt of advice in confidence.

✦ ✦ ✦

Vernon Royle Dies

VERNON Royle, president and treasurer since 1885 of John Royle & Sons, Paterson machinery manufacturers, died recently at his home. He was eighty-eight years old.

✦ ✦ ✦

MR. Royle held more than 150 patents on improvements he had invented for machines and tools used in photo-engraving, textile and fire-hose weaving, rubber shaping and the manufacture of electrical insulation. Most of the machines were manufactured by Mr. Royle in his Paterson plant and his Royle card cutting machine is now used by most jacquard mills.

✦ ✦ ✦

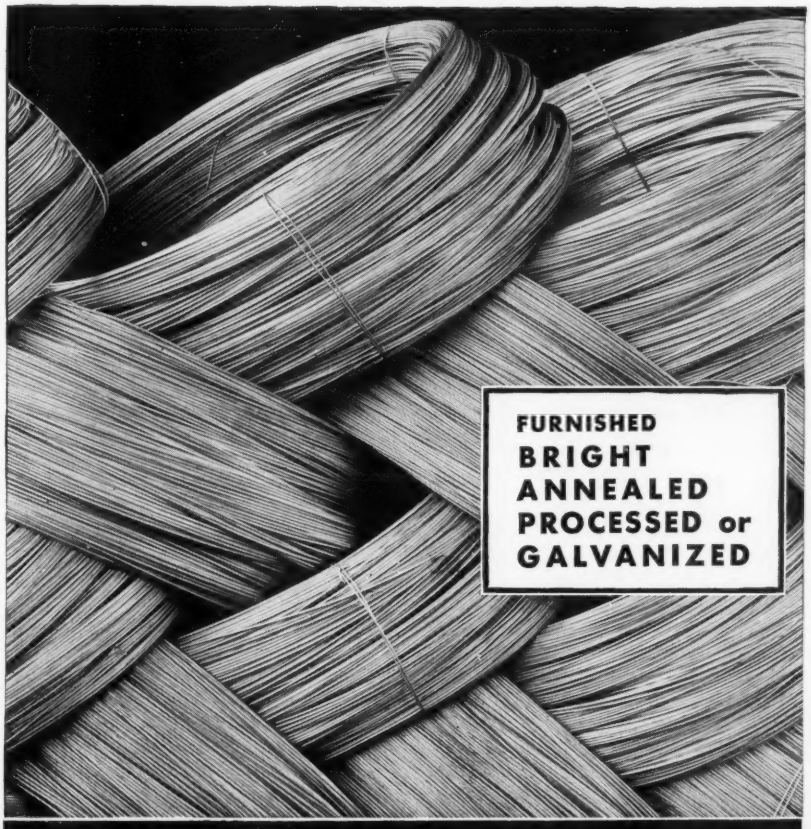
MR. Royle was born in Paterson, the son of the late John Royle, who, with his brother, founded the machinery factory here in 1855.

✦ ✦ ✦

MR. Royle was secretary of the Paterson Board of Education from 1872 to 1889 and was a director of the Hamilton Trust Company here for many years. His son, Vernon E. Royle, is vice president of John Royle & Sons.

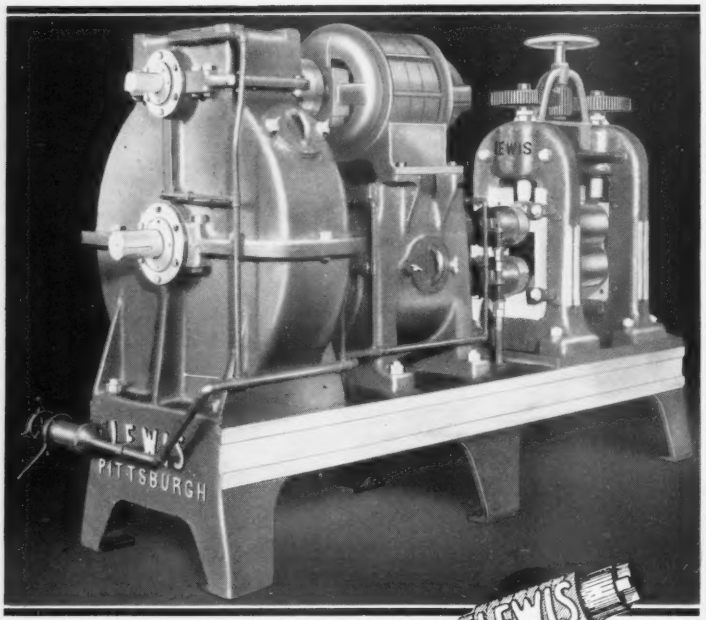
CONTINENTAL
OPEN HEARTH
STEEL WIRE

Made in standard commercial grades, copper bearing, or Konik Metal. Sizes range from 23 gauge to 5/8 inch, and can be shipped in coils or straightened and cut. Is especially adapted to all types of manufacturing needs and can be supplied in special analyses to meet the most exacting specifications. Konik Metal is especially recommended for case hardening. All inquiries receive the careful attention of our well equipped and experienced metallurgical department. Write us about your needs — no obligation, of course.



CONTINENTAL STEEL CORPORATION
KOKOMO, INDIANA
Manufacturers of Billets, Rods, Wire, Barbed Wire, Nails; Lawn, Chain-Link, Diamond Mesh, Farm and Poultry Fence; Gates; Black, Galvanized, Galvannealed and Special Coated Sheets; Galvanized Roofing; also "Seal of Quality" Roofing and Kindred Products.

LEWIS WIRE FLATTENING AND NARROW STRIP MILL



Unit Construction.

Lewis Cut Herringbone Gear Reduction Unit directly connected through a flexible coupling.

Forged Steel Pinions.

Bearings are lubricated by compression grease cups.

All gears run in oil.

Neck Bearings are die cast genuine babbitt or roller bearings.

Housings have T slots for attaching coilers and guide bars.

This Mill is built in a complete unit and can be moved at any time to any desired location in the plant. The rolls may be of any quality specified by customer, including hardened steel rolls, or water cooled rolls.

• • •

LEWIS MAKES A COMPLETE LINE OF ROLLING MILL MACHINERY INCLUDING:

Mill drives up to and including 6,000 HP. Shape Straightener Machines up to and including 24 inch I beam. Motor operated Screw-Down for Mill. High Speed Gear Sets for Continuous Rod Mills. Continuous Bar and Billet Mills. Cold Mills for Sheet and Strip. Rail Breakers. Rail Re-Rolling Mills. Universal Mill Spindles. Chilled Iron and Iron Alloy Rolls for Iron, Steel, Brass, Copper, Aluminum, Zinc and Nickel. For hot Sheets, tin plate and strip—for cold sheets, tin plate and strip. For merchant bars and rods, Shears—Vertical Alligator—Cropping—Plate and Squaring. Special Machinery—Testing Machines and Iron and Steel Castings.

PITTSBURGH, PA.

LEWIS FOUNDRY & MACHINE CO.

Fifteen Generations in the Wire Industry

(*Continued from page 15*)

several families of skilled wire workers, among them a group by the name of Highley, who settled at the Abbey works and studied the art of wire drawing for three hundred years. In 1851 there appeared on the parish records one Nehemiah Highley, who is no other than the old gentleman of the Pittsburgh suburb who started me on this train of thought. Little Nehemiah's earliest recollection, dating probably 1855, is of going out into the forests with his grandfather, riding on pack-ponies, to buy fuel from the charcoal burners. His grandfather, like most of his generation, was partially literate but not strong on figures, and the accounts were kept by cutting notches in a squared stick. This charcoal was chiefly for the smelting hearths, small open fires where small masses of very slaggy and dirty iron were produced by a direct reduction process. This iron was squeezed, hammered, and rolled, and reached the wire mill in 14 pound bundles called "fagots".

✦ ✦ ✦

IN the course of time Mr. Highley was apprenticed to a Mr. Henry Hughes, both parties signing an impressive looking parchment ornamented with all the sealing wax, Spencerian script, ribbons and coats of arms characteristic of the period and circumstances. In it Mr. Highley promised to faithfully serve his masters, keep their secrets and do their commandments, to do no damage to his masters nor see it done by others, but to warn them of evil. He undertook to neither commit fornication nor to marry, to shun cards and the dice table, not to haunt taverns, nor unlawfully absent himself from service. This indenture is still in Mr. Highley's possession.

✦ ✦ ✦

WHETHER young Highley carried out his contract to the letter I am not sure. He tells me that the mill in which he worked had a vertical shaft piercing three floors, and a drive taken off at each floor by gearing. This sounds much like the three story mill de-

scribed in 1678. The gears were of iron, plain wheels with square holes in the rims, into which were keyed the teeth, which were individual blocks of beech-wood. When the apprentices wanted a day off, some tough egg, (not Mr. Highley, of course) would unkey a tooth and reverse it, and when the shaft started up all the teeth would be stripped.

✦ ✦ ✦

PICKLING with acid was practised, but much of the wire was cleaned by the older method of the tumbling barrel with water and gravel, which gave it a harder surface. Lime coating and baking interesting to note that Mr. David were in use, and tallow was a favorite in the die box. Two or three drafts was all that the iron would stand between anneals.

✦ ✦ ✦

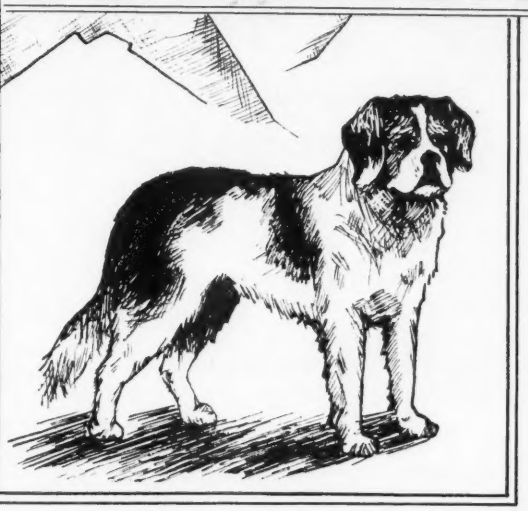
IN 1884 the old Abbey mill had passed into history and Mr. Highley came to Pittsburgh, to which town he soon moved his family. He drew wire for Oliver & Roberts for many years. It is interesting to note that Mr. David Oliver, one of his employers, is still hale and hearty and expects this month to celebrate his one hundredth birthday. Stout fellows, these wire men. Mr. Highley went to the South Side mill of Jones and Laughlin in the very early days of cold drawing at that plant, and during the war he assisted in starting their Hazlewood mill. At the age of 70 Mr. Highley retired, settled down in a pleasant neighborhood in the South Hills, and awaited the coming of old age. After two or three restless years he decided that old Father Time had misplaced his number. He studied up the subject of fire insurance, passed examinations, and was granted an agency. This insurance work, the teaching of a Sunday School class of "young people" ranging from 40 to 60 years of age, miscellaneous church and civic duties and a side-hill garden, combined to keep his blood pressure down.

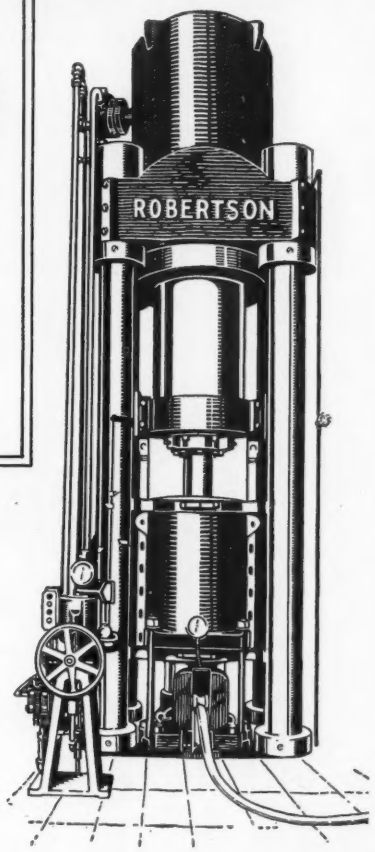
✦ ✦ ✦

THE most significant change Mr. Highley has seen, in nearly eighty years of wire mill contacts, is in the nature of the raw mater-

(*Please turn to page 40*)

DEPENDABLE





—and Highly EFFICIENT

As the St. Bernard dog is symbolic of dependability, faithfulness and usefulness to mankind generally, so is the Robertson Lead Encasing Cable Press to cable manufacturers and those associated with them.

Robertson Presses are designed from three quarters of a century's experience and built by true craftsmen—the result being that they are practically regarded as "standard" by many cable makers here and abroad.

Robertson Presses are made to be DEPENDABLE in their specific functions of making and applying lead sheath to all types of insulated wires and cables from ¼" to 5" diameter. They are regularly built in hydraulic capacities of from 1,000 to 2,500 tons.

All allied equipment for the operation of these Presses may be had from Robertson. Write for data.

Robertson equipment includes: Lead-encasing Presses for Electrical Cable and Rubber Hose Manufacturers — Extrusion Presses for Lead Pipe, Lead Traps, Solder and Lead Wire. Sheet Rolling Mills, Hydraulic Pressure Pumps, Hydro-pneumatic Accumulators.

Are you receiving our little magazine, "Robertson Reminders"? If not, send us your name and address, and we'll gladly send it to you—regularly.

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Are Endorsed as the
NEW AND BETTER INSULATION

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give greater dielectric strength
..and make a better covering at
a lower cost.

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Packaged to fit all standard insulating machines.

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Write us for complete information
and samples of covered wire.

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General Offices TROY, N. Y. Laboratories

WIRE MILL FOR SALE

EQUIPPED TO DRAW FINE STEEL WIRE

in sizes from No. 15 to 36. All Finishes.

**Located in East—Accessible to all Markets—
Low price—Satisfactory Terms.**

FOR INFORMATION ADDRESS

**BOX 200—C/O WIRE AND WIRE PRODUCTS
17 East 42nd St., New York, N. Y.**

Incandescent Lamp Sales in 1934

A PRELIMINARY estimate of the number of incandescent lamps sold in the United States during 1934 indicates a total of 645,000,000 for both large and miniature lamps, according to a review of the electrical industry by John Liston in the General Electric Review for January. This figure, higher than that of any previous year, represents an increase of more than four per cent over the sales in 1933, and approximately two per cent higher than that of 1929, the previous high year.

✦ ✦ ✦

THE 1934 total included 376,000,000 large lamps and 269,000,000 miniature ones. Use of carbon-filaments, as in previous years, continued to decrease. The total of these, both large and miniature bulbs, is estimated to have been only slightly more than a million.

Fifteen Generations in the Wire Industry

(*Continued from page 39*)

ial. He has seen the "finery blooms" superseded by puddled iron, puddled iron by bessemer steel, and bessemer by basic. With each change has come a notable increase in uniformity, in the ability of the material to stand heavy drafts, and to take a substantial total reduction between annealings, and a great increase in the bundle weight and the output per man.

✦ ✦ ✦

WHILE Mr. Highley's wire drawing days are over, his oldest son is superintendent of a wire mill and a grandson is turning rolls in a rod mill. The Highley tradition is safe for two more generations.

Editor's Note: Since this article was written Mr. Highley died at his home in Pittsburgh.

✦ ✦ ✦

Japanese Place Order With Lewis Foundry & Machine Co. For 3-High Rolling Mill

AN order for a 68-inch "three high" rolling mill, with tables, motor and controls, for a Japanese steel company was received today by Lewis Foundry & Machine Co., a subsidiary of Blaw-Knox Co., Albert C. Lehman, president of the latter company, announced recently.

✦ ✦ ✦

THE mill will be used for rolling sheet steel, having a capacity of 70 tons 16-gauge sheet per eight hour shift, and will be driven by a 500-horsepower electric motor. Delivery will be in ten to twelve weeks.

✦ ✦ ✦

THE Nickel Alloy Company, of Philadelphia, Manufacturers of Resistance Wire, Pure Nickel and Nickel Alloys, has increased its Preferred Stock from $100,000.00 to $250,000.00, and have recently installed additional equipment for wire drawing and cold rolling. Mr. M. L. Murray, who has been identified in the wire business for the past forty years, has been elected President and General Manager of this Concern.

How Piano Wire is Used in Constructing Bridge Models

(*Continued from page 16*)

WEIGHTS attached by hooks to the model structure represent the proper distribution of actual weight of structure on the model. Live loads are represented by additional weights which may be attached or removed at will to simulate any desired conditions of loading. Wind is represented by weights which are suspended by silk threads over pulleys and attached so as to produce a horizontal pull on the model. Temperature changes are simulated by contraction or expansion of supports in lieu of the expansion or contraction of the super structure.

✦ ✦ ✦

SOME of the tests that have been made and which may be of interest to readers include the following: Measuring stresses in main cable; measuring stress in the stiffening truss; vertical movements of roadway under live load; horizontal movements of roadway due to wind; movement of tower; grade changes; truss reaction at the supports. Measuring the main cable stress is done by measuring the stretch of a 20-inch length of cable to the nearest 5/10,000 of an inch. Any stretch is directly proportioned to the stress, therefore the engineers can foretell the stress knowing the stretch.

✦ ✦ ✦

Outdoor Exposure Tests of Galvanized Wire

(*Continued from page 18*)

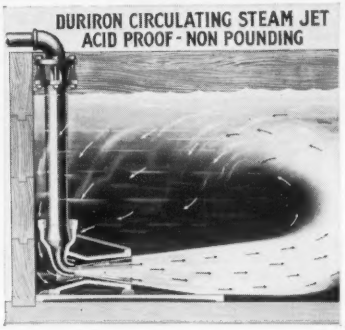
ing of samples and the laboratory work necessary to characterize them.

✦ ✦ ✦

THE Committee has also been assisted tremendously by technical experts from the agricultural colleges and societies who have contributed largely to the planning of the tests and have made available test sites for the long periods of time necessary to complete the investigation. As the tests progress to a point where accurate engineering information regarding the durability of fencing becomes available, such information will be released promptly.

Isn't this about what you want in *your* Pickling Tank?

Complete circulation of pickle liquor . . . rapid heating . . . no destructive pounding.



You don't need the "Old Man" to tell you that operating economies are part of the New Deal — you know that.

But did you know that Duriron and Durichlor Heating Circulating Steam Jets for Pickling Tanks line up under that policy? They do a better job, heat tank contents quicker, don't loosen up the tank thereby saving acid, and cut down steam requirements. Use "DURIRON" for Sulphuric—"DURICHLOR" for Muriatic Acid.

Send for Bulletin 165 which includes a table for figuring the steam requirements in pounds per hour for your size tank.

THE DURIRON COMPANY, Inc.

442 N. Findlay St., Dayton Ohio

— DESCO —

A PICKLING STABILIZER ▲ ▲ ▲
FOR CARBON STEELS ▲ ▲ ▲

▲ ▲ ▲

The strong passivating effect of this excellent inhibitor insures a bright finish and forms a sound basis for a bright drawing technique—

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DELANY CHEMICAL CO.

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"NEPOWDER" 100%
"NEP" 22 Liquid SUM-FOAM 100%

The Only PURE INHIBITORS Produced
NO SALT or Other DOPE USED

You will now specify your
INHIBITOR Requirements 100% Pure

You save—75% Freight Charges
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For 20 years we have produced the Best INHIBITOR in each year

✦ ✦ ✦

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ACTIVE IN STEEL SINCE 1860

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Cold Drawn
HIGH CARBON STEEL
SPRING WIRE

A Quality Product of
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Possessing Uniformity in—
Tensile strength for loading capacity
Elasticity and resilience for spring action
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Quality Insured by—
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PEORIA ILLINOIS

Formula For the Determination of Total Feet Wound on Any Drum or Reel

DRUMS and reels are commonly used for storing round rope, cables, wire, hose, etc., and it is sometimes desired to determine the total length either by computation or measurement.

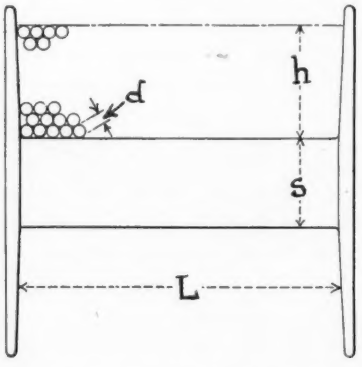
✦ ✦ ✦

INASMUCH as I have never seen a satisfactory formula for computing the length of these stored or wound up articles I tried my hand at devising such a formula or rule. As a result I have developed what I believe to be a simpler and more practical rule, and a more accurate one, than has heretofore been published.

✦ ✦ ✦

WHEN a rope, cable, or wire winds upon a drum or reel it naturally assumes a position such as I have endeavored to indicate in the sketch herewith. That is, the rope when winding onto the first layer seeks the "valleys" between the turns of the first layer. In this way the maximum length is wound onto the drum. This is particularly true if the rope is taut.

✦ ✦ ✦



TO determine the number of feet on a drum, properly wound, four measurements are necessary as shown in the sketch:

h=depth of material on drum, inches;
S=diameter of drum, inches;
L=length of drum, inches;
d=diameter of rope or wire, etc., inches.

THE rule is as follows: "To the depth of the rope or cable "h", add "s" the diameter of the drum, (all measurements in inches), multiply by the depth "h" in inches, then multiply by the inside length of the drum in inches marked "L" in the sketch, then divide by the square of the diameter of the rope in inches, and lastly multiply by 0.3. The answer is the length in feet.

✦ ✦ ✦

TAKE, for example, a drum in which h=10 in.; S=20 in.; L=50 in.; and the diameter of the rope, d, is ½ in. How many feet of rope on the drum? Apply the above rule and it will be found that the answer is 18,000 feet.

✦ ✦ ✦

Brown Instrument Co. Consolidates With Minneapolis-Honeywell Co.

THE Brown Instrument Company, Philadelphia, Pa., announces a consolidation with Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.

✦ ✦ ✦

THE Brown Instrument Company will continue as a separate Company with its existing organization but as a subsidiary of Minneapolis-Honeywell Regulator Company. Richard P. Brown will continue as President of The Brown Instrument Company and will become an officer and director of Minneapolis-Honeywell Regulator Company.

✦ ✦ ✦

THE Brown Instrument Company sales and service facilities will be continued from the present main office and factory at Philadelphia and the district offices located throughout the country.

✦ ✦ ✦

BY co-ordinating the Research, Development and Engineering activities of these two companies, each a leader in its field, a greater service to industry will be made possible.

Manufacturers of materials, tools and equipment for wire drawing and forming plants are constantly making improvements and additions to their lines. If you do not find the product or service in which you are interested, additional information will be supplied promptly. Simply address:

WIRE & WIRE PRODUCTS
17 East 42nd Street New York City

AMERICAN LIME & STONE COMPANY — Bell Mine Products — WARNER COMPANY—MANAGEMENT

IN 1935

Bell-Mine Pulverized Lime will continue to be eminently suited for use in the Wire Industry because of its uniformity, freedom from grit, dependable adhesion and covering quality.

Approved by many wire makers, it is the Lime to choose and use.

AMERICAN LIME AND STONE CO.
(OPERATING UNDER N. R. A. LIME CODE)
PLANT and EXECUTIVE OFFICE: BELLEFONTE, PA.
Sales Offices: PITTSBURGH PHILADELPHIA NEW YORK CITY

***Learn about* PARALAN**

Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

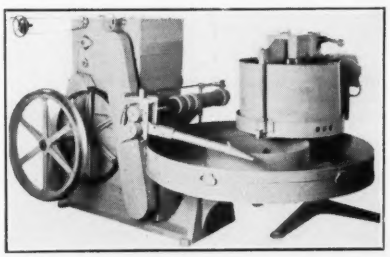
Write for further information. We may be able to solve your difficulties.

AMERICAN LANOLIN CORP.
LAWRENCE, MASSACHUSETTS

IMPROVED MODEL of the

Aimco Panning Machine with Variable Speed Countershafts and Capstan self-contained on one bed-plate (Ball Bearings throughout) shown with the

AIMCO Motor Driven Automatic Talc Spreader
(Patents pending)



For panning rubber covered wire before vulcanization.
Send for descriptive circular.

EST. 1855 AIMCO INC. 1913
"American" INSULATING MACHINERY COMPANY
REG. U.S. PAT. OFF.
517 West Huntington St.
PHILADELPHIA PENNSYLVANIA U.S.A.

Premier

DIAMOND DIES

DRIVER-HARRIS COMPANY · HARRISON, N.J.

STEELSKIN

REG. U. S. PAT. OFFICE

For High or Low Carbon Wire

WIRE DRAWING SOAPS

Established 30 years

R. H. MILLER CO., Inc. Homer, N.Y.

BALLOFFET

The Quality Diamond Dies

1870 1935

BALLOFFET DIAMOND WIRE DIES CO. INC.,
13-15 East 22nd Street, New York City
Factories in France: Lagnieu-Cluses-Trevoux

Patents—Trade Marks

Before disclosing your inventions to anyone send for blank form "Evidence of Conception" and instructions "How to Establish Your Rights".

All cases submitted given personal attention by members of the firm. Information and booklet free.

Lancaster, Allwine & Rommel

PATENT LAW OFFICES

Suite 438, Bowen Building 815-15th St., N.W. Washington, D. C.

New WIDIA Handbook

A new handbook and catalog on WIDIA cemented carbides, as used in tools, wear-resisting parts, and other similar applications, has just been published. The handbook contains twenty-four pages and cover, and is 8½ x 11″ in size.

✦ ✦ ✦

THIS handbook covers the following points:

Method of Manufacture.
Salient Characteristics.
Advantages to be Obtained through the Use of WIDIA Cemented Carbides.
Various Grades Available and their Particular Applications.
Recommendations Regarding the Modern Methods of Use of the Cemented Carbides.
Proper Tool Design.
Practical Application of the Metal Cutting Theory for Practical Men—The Advantages to be Obtained from High Speeds Possible with Cemented Carbide Tools.
Recommended Grinding Procedure.
Brazing Instructions—How to Make your own Cemented Carbide Tools.

✦ ✦ ✦

THE hand book is profusely illustrated, and several pages are devoted exclusively to photographs showing some recent applications of WIDIA cemented carbide to various special tools, such as intricate cutters, as well as various wear-resisting parts which do no cutting—for instance, sand blast nozzles, centerless grinder rests, thread guides, electrical contact points, etc.

A copy can be obtained without charge by addressing Wire & Wire Products, 17 E. 42nd St., New York, N. Y.

✦ ✦ ✦

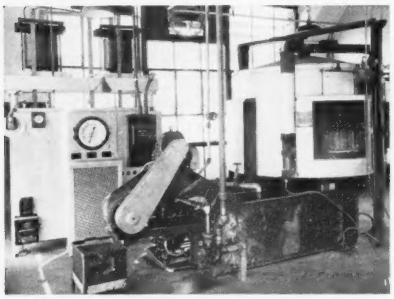
Outstanding Personalities in The Wire Industry

(*Continued from page 28*)

ness most of his life. At 16 he went to work for the American Steel & Wire Co. After working there 22 years he went to the Otis Steel Co.

Rotary Hearth Type Furnace for Treating Miscellaneous Small Parts

A SMALL rotary hearth type furnace for the economical heat treatment of miscellaneous lots of small and medium size products has recently been developed and built by The Electric Furnace Company, Salem, Ohio.



THE Material is charged onto tilting trays by a sliding bottom loading pan, carried around the furnace on an alloy hearth, heated to the necessary temperature and dumped through a chute to a water or oil quench. With this furnace the handling of small lots of miscellaneous small and medium size products is placed on a continuous and economical basis.

✦ ✦ ✦

THIS furnace is specially adapted for the handling of springs, bolts and miscellaneous machine screw products.

✦ ✦ ✦

THE accompanying photograph shows the charging door of the furnace, quench tank, conveyor, recording controllers, etc. The transformers are shown mounted above the control panel.

✦ ✦ ✦

F. S. Chase President Of Copper & Brass Research Association

A REORGANIZATION meeting of the Copper & Brass Research Association was held recently with the mining companies withdrawing and the fabricating members formulating plans for a promotional campaign for the forthcoming year.

✦ ✦ ✦

THE following officers were elected:

President, F. S. Chase, president of Chase Brass & Copper Company.

Vice-president: John A. Coe, president of The American Brass Company; C. D. Dallas, president of Revere Copper & Brass Incorporated; Wylie Brown, president of Phelps Dodge Copper Products Corporation.

Treasurer, C. T. Ulrich, vice-president and treasurer of Kennecott Copper Corporation.

Secretary, B. B. Caddle.

✦ ✦ ✦

THOSE elected to the Board of Directors are: F. S. Chase and R. L. Coe, Chase Brass & Copper Company; C. D. Dallas and J. A. Doucett, Revere Copper and Brass Incorporated; John A. Coe and John A. Coe, Jr., The American Brass Company; E. O. Goss and W. M. Goss, Scovill Manufacturing Company; R. E. Day and Herman W. Steinkraus, Bridgeport Brass Company; Wylie Brown and H. A. Staples, Phelps Dodge Copper Products Corporation; C. C. Limbocker, Wolverine Tube Company; C. T. Ulrich, ennecott Copper Corporation and B. B. Caddle, Secretary of the Association.

✦ ✦ ✦

AN operating committee consisting of J. A. Doucett, chairman, R. L. Coe, John A. Coe, Jr., Herman W. Steinkraus and W. M. Gross was appointed.

✦ ✦ ✦

Johnson Steel & Wire Co. New Ohio Plant

THE **Johnson Steel & Wire Company,** of Worcester, Mass., has purchased a building and tract of land in Cuyahoga Falls, O., and in addition to the building now on the property will erect a new plant to be equipped for the manufacture of steel wire. Production will start early in 1935.

J. H. Paterson, of South Bend, Ind., has been appointed general manager of the Cuyahoga Falls plant.

SEND IN YOUR LISTINGS FOR THE ANNUAL WIRE BUYERS GUIDE AND YEAR BOOK OF THE WIRE ASSOCIATION

Kelly Wire Die Corporation

✦

TANTALUM

TUNGSTEN

&

DIAMOND

DIES

✦

Kelly Wire Die Corporation

Vascoloy Ramet Agents

256 W. 31st St., NEW YORK

Bissett Steel Reorganizes Die And Tool Departments

THE Tungsten Carbide Die, Tool and Specialty Department of The Bissett Steel Company of Cleveland has been reorganized and will henceforth be operated as a separate corporation named "Tungsten Electric Corporation, Bissett Steel Division".

✦ ✦ ✦

THE manufacturing and sales will be handled by the same personnel as before the change, with the increases required by the broader scope of the new company, with executive offices and main manufacturing plant in Cleveland.

✦ ✦ ✦

A BRANCH manufacturing plant has been built in Chicago, and is no win operation, and later additional branches will be built in other cities requiring local manufacturing service. The Bissett Steel Company branch warehouse in Cincinnati will be used for the present as the Cincinnati headquarters of the new corporation.

PAPER CABLE FILLER
FOLDED PAPER FLATS
PAPER INSULATION YARNS
E. W. TWITCHELL, INC.
Formerly National Patent Reed Co.
3rd & Somerset Sts. Phila., Pa.

Broden Construction Co.
Wire Mill and Cold Rolling Equipment
10255 Harvard Ave.
CLEVELAND, OHIO

WIRE MILL EQUIPMENT
MORGAN CONSTRUCTION CO.
WORCESTER, MASS.

RUESCH
Machinery For
Wire, Tube, And Brass Mills
409 Mulberry St., Newark, N. J.

WIRE DRAWING MACHINERY AND EQUIPMENT
Rod Frames—16" Frames, 8" Frames —Take-Up Frames, Wire Pointers—Puller Tongs.
General Castings for Wire Mill use.
Circulars on Request.
E. J. SCUDDER FOUNDRY & MACHINE CO.
TRENTON, N. J.

Kenneth B. Lewis
CONSULTING ENGINEER
Wire Mill Equipment, Layout and Practice
17 East 42nd St. New York City
43 Midland St. Worcester, Mass.
Phone: Murray Hill 2-4188
Phone 5-6033

ZINC WIRE
THE PLATT BROS. & CO.
WATERBURY, CONN.

VIANNEY
Famous Wire Drawing Diamond Dies
250 East 43rd St., New York

Testing and Controlling Metallic Coatings on Wire

(*Continued from page 11*)

per 8.94 gr/cm³ an alloy of 90% Ni: 10% Cu weighs 8.70 gr/cm³. By substituting these values for the general indices when calculating the volume of the alloys per cm. of wire, we obtain 0.001165 :8.7 = 0.000134 cm³. The thickness of the alloy or gradation layer results

$$d_2 = \frac{0.000134}{3.14 \times 0.4 \times 1} = 0.0001068 \text{ cm.}$$

✦ ✦ ✦

THE nickel plating process added therefore a protective layer of 0.00269 mm. plus 0.001068 mm or a total of 0.00375 mm to the original copper wire. This equivalent to about 0.000148 in.

✦ ✦ ✦

A mathematical comparison between the amount of nickel plated upon the copper wire and the weight of nickel determined by the described method with identical specimens discloses antest efficiency of 96 to 98 per cent; the balance of 2 to 4 per cent comprises presumably experimental errors, losses in electrical potential between the meters and parts, temperature effects, lack of knowledge of the exact average composition of the intermediate zone, etc. Irrespective of these shortcomings at the time of this writing, additional research work in clarifying these assumed losses will undoubtedly set forth definite corrective factors into the above outlined calculations, thus guaranteeing a higher degree of percentual accuracy than that of most analytical methods. So far the Glazunov method must be considered as entirely satisfactory even for the most exacting practical purposes, for which it was primarily intended.

Surplus Wire Drawing Machinery and Equipment for sale, including rod frames—16" frames—8" frames.
Also Galvanizing and Tinning furnaces and take-up frames, Annealing and Pickling Equipment.
THE SENECA WIRE & MFG. CO.,
FOSTORIA, OHIO.

EFFICIENT PICKLING
REQUIRES "RODINE"
RODINE, SAVES ACID AND METAL
Prevents over-pickling. Minimizes acid brittleness and acid fumes.
Samples and Directions sent on request.
AMERICAN CHEMICAL PAINT CO.
AMBLER, PA.
Detroit Office & Warehouse 6339 Palmer Ave.; E.

Continuous Straightening and Cutting Machinery
With
FLYING SHEAR
for round and shaped wire.
✦ ✦ ✦
THE HALLDEN MACHINE COMPANY
THOMASTON CONNECTICUT

BISCO
TUNGSTEN CARBIDE DIES
For Wire, Rod and Tubing
Round and Special Shapes
TUNGSTEN ELECTRIC CORP.
BISSETT STEEL DIVISION
Cleveland
Cincinnati Chicago Philadelphia

Wire Mill Equipment, Stranding, Insulating, Drawing, Welding
Thomson-Judd Wire Machinery Co.
Subsidiary of
Thomson-Gibb Electric Welding Co.
Lynn, Massachusetts.

Wire Drawing Diamond Dies
COCHAUD
WIRE DIE CORPORATION
300 W. 56th ST., NEW YORK
Tel. Col. 5-1340

BUYERS' GUIDE

For more complete information, consult the annual Directory, Index & Buyers' Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

ANNEALING FURNACES
See Furnaces—Various Headings

ANNEALING POTS AND BOXES
Scudder, E. J., Fdry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT
Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

BAKERS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CASTINGS—Wire Mill
E. J. Scudder Foundry & Machine Co., Trenton, N. J.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelph'a, Pa.
Grasseli Chemical Co., Cleveland, O.

CLEANING & PICKLING EQUIPMENT
Broden Construction Co., Cleveland, O.
Duriron Co., The, Dayton, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

COATING—Protective
American Lanolin Corp., Lawrence, Mass.

COILERS—Sheet and Wire
Borden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.

CONDUITS—Iron and Steel
Youngstown Sheet & Tube Co., Youngstown, Ohio.

COPS—Paper
Manning Paper Co., John A., Troy, N. Y.

CRANES—Wire Mill
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTERS—Wire, Rod, Bar
Porter, H. K., Co., Everett, Mass.

DIES—Diamond
Association of Wire, Rod and Tube Die Mfgrs., Inc., New York, N. Y.
Ballouffet Diamond Wire Dies Co., Inc., N. Y. C.
Cochaud Wire Die Co., New York.
Driver-Harris Co., Harrison, N. J.
Kelly Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Cochaud Wire Die Corp., New York.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Vianney Wire Die Wks., N. Y.

DIES—Rod and Tube Drawing
Association of Wire, Rod and Tube Die Mfgrs., Inc., New York, N. Y.
Bissett Steel Co., Cleveland, O.
Carboloy Co., Inc., Newark, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DIES—Tantalum Carbide
Bissett Steel Co., Cleveland, O.
Kelly Wire Die Corp., New York, N. Y.

DIES—Tungsten Carbide
Bissett Steel Co., Cleveland, O.
Carboloy Co., Inc., Newark, N. J.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DRAW BENCHES
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.

ENGINEER—Consulting Wire Mill
Lewis, Kenneth B., New York, N. Y.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FILLERS—Paper for Cable
E. W. Twitchell, Inc., Phila., Pa.

FURNACES—Annealing
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.

FURNACES—Automatic
Electric Furnace Co., Salem, O.

FURNACES—Bright Annealing
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.

FURNACES—Electric
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
John Robertson Co., Brooklyn, N. Y.

FURNACES—Non-Oxidizing
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.

FURNACES—Wire, Strip and Sheet
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.

GRINDERS—Roll
Norton Co., Worcester, Mass.

HANDLING EQUIPMENT—Material
Cleveland Electric Tramrail, Div. of Cleveland Crane & Eng. Co., Wickliffe, O.

HOISTS—
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelph.a, Pa.
Grasseli Chemical Co. Cleveland, O.
Wm. M. Parkin Co., The, Pittsburgh, Pa.

INSULATION—Cable or Cable Filler
E. W. Twitchell, Inc., Phila., Pa.

INSULATING PAPER—For Magnet and Enamelled Wire
Manning Paper Co., John A., Troy, N. Y.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIME—Pulverized
Amer. Lime & Stone Co., Bellefonte, Pa.

LUBRICANTS—Wire Drawing
R. H. Miller Co., Homer, N. Y.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
John Robertson Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
New England Butt. Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Bunching
Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Machinery Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Coilers
Broden Const. Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
H. J. Ruesch Machine Co., Newark, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Extruding
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Forming
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
H. J. Ruesch Machine Co., Newark, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Machinery Co., Phila.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
John Robertson Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

BUYERS' GUIDE, Continued

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Measuring Wire & Cable
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Machinery Co., Phila.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Morgan Const. Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Lewis F'dry & Machine Co., Pittsburgh, Pa.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Lewis F'dry & Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Rubber Strip Covering
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila. Pa.
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry and Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Machinery Co., Phila.
Fidelity Machine Co., Philadelphia, Pa
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Const. Co., Cleveland, O.
Lewis F'dry & Machine Co., Pittsburgh, Pa.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Swaging
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Taping
Amer. Insulating Mach. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Tinsel Rolling Mills
Amer. Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Machinery Co., Phila.
Broden Const. Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.

MATERIAL HANDLING EQUIPMENT—
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PAPER—Insulation
Manning Paper Co., John A., Troy, N. Y.

PAPER—Packaging (For Wire Cable)
Manning Paper Co., John A., Troy, N. Y.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Grasselli Chemical Co., Cleveland, O.
Wm. M. Parkin Co., The, Pittsburgh, Pa.

POTS—Lead Melting
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Encasing
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
E. J. Scudder Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Sleeper & Hartley, Inc., Worcester, Mass.

REEL CRUTCHES
Watson Machine Co., Paterson, N. J.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

RODS—Wire—Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

RODS—Wire—Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLLING MILLS—See Machinery—Rolling Mill

ROLLS—
Lewis F'dry & Machine Co., Pittsburgh, Pa.

RUST PROOF COMPOUND
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Superior Sheet Steel Co., Canton, O.

SOAPS—Wire Drawing
R. H. Miller Co., Homer, N. Y.

STRIP—Brass, Zinc and Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

STRIP—Steel
Continental Steel Corp., Kokomo, Ind.
Driver-Harris Co., Harrison, N. J.
Fifth Sterling Steel Co., McKeesport, Pa.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS
H. J. Ruesch Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Proof
Duriron Co., The, Dayton, O.

VULCANIZERS
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS
American Insulating Mach'y Co., Phila., Pa.

WIRE—Enameled For Coils
Winsted, Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Company, Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

WIRE—Non Ferrous to Specification
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.
Winsted, Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Continental Steel Corp., Kokomo, Ind.
Keystone Steel and Wire Co., Peoria, Ill.
Seymour Mfg. Co., Seymour, Conn.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Brass, Zinc
Platt Bros. & Co., The, Waterbury, Conn.

This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

Electric Cable and Wire Rope Machinery:

STRANDERS	Planetary & Rigid Frame types (*horizontal and vertical.*) High-Speed Tubular and Built-up types.
BUNCHERS	High-speed types for spools up to 1500 lb. capacity.
ARMORING MACHINES	For Wire (*planetary type*) and for Tape.
PAIRING & TRIPLING MACHINES	For Bare & Insulated Wire.
CLOSERS	For Wire in Planetary, High-speed & Angular types.
CLOSERS & CABLERS	For electric cable in Planetary and Angular types.
TAPING MACHINES	Eccentric and Concentric types, for Paper, Friction and Varnished Cambric and Burlap types.
TAPING HEADS	For applying steel tape in Eccentric and Concentric high-speed types.
JUTE & BURLAP	Applying Heads.
THREAD SERVERS	For Cotton, Asbestos, etc. application on hose and wire.
COMPOUND TANKS	Electrical or Steam heated for machine or unit application.
CHALK APPLIERS	Wet and Dry types.
CAPSTAN SECTIONS	With Single tapered and double grooved wheels, with Lay Control by gears or variable speed transmission.
LET OFF REEL STANDS	Shaft and Shaftless types, for any size of reels.
WINDERS	For steel and copper, in single or multiple head units.
COILING MACHINES	Power or manual drive for package coiling—also for warehouse and shipping room use.
COILING HEADS	For wire rope and insulated wire and cable.
TAKEUP STANDS	Inclined frame, Shaftless and Heavy-duty types.
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TEMPERING & GALVANIZING MULTIPLE HEAD TAKEUPS	For wire.
MEASURING MACHINES	For Length Measurement.
ELECTRIC PATCH VULCANIZERS	
SATURATING, WAXING & GREASING TANKS	Gas fired and Electrical.
WIRE TINNING MACHINES	Gas fired and Electrical.
CABLE PEELERS	For removing lead sheathing and insulation.
POLISHING HEADS	Separately or Motor driven.
REEL CRUTCHES	For turning heavy reels in handling and shipment.
MOTORIZED WINCHES	For general duty in cable and rope plants.
CUTTERS	For wire rope, cable and chain.
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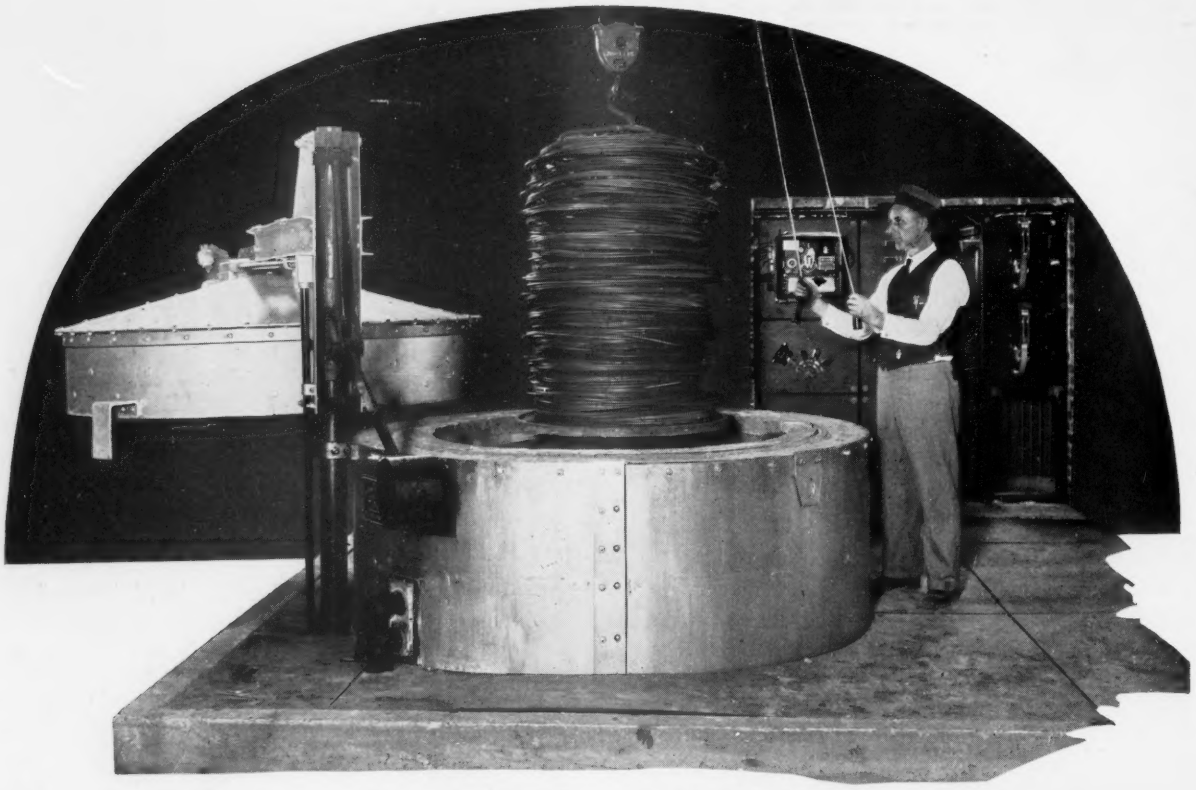

Furnaces for the Wire Industry

The above illustration shows one unit of an installation of furnaces made in a prominent steel plant for annealing alloy wire rod in coils, without scale of decarburization, a special furnace for a special process. Recent developments and installations include several other interesting furnaces for the wire industry, including:

IMPROVED PIT TYPE FURNACES

For Annealing Steel Wire in Coils, which offer the following advantages:

Increased tonnage per pit.
Improved fuel economy.
More uniformly annealed wire.
Improved surface conditions.
Decreased annealing time and labor requirements.
Maximum flexibility,—wire can be annealed bright or dull.

CONTINUOUS FURNACES

For Bright Annealing Copper Wire.

A new continuous furnace for bright annealing fine copper wire on spools. The spools are loaded into trays and pushed through the furnace by hydraulically operated pusher head, pushing at any predetermined intervals. The material is discharged from the furnace uniformly annealed, bright, clean and dry—ready for shipment, further processing or fabricating.

Other recent installations include furnaces for clean annealing brass wire, scale-free hardening bolts, etc., billet heating, bright annealing, brazing, carburizing, hardening and other heating and heat treating processes;—put your problems up to our engineers. No job is too large or too difficult.

We Build the Furnace to Fit Your Job---For Oil, Gas or Electric Heat

The Electric Furnace Co., Salem, Ohio

Head Office and Works of The Electric Furnace Company, Salem, Ohio . . . located on main line of the P. R. R. . . . the largest plant in the country devoted exclusively to designing and building industrial furnaces and auxiliary equipment.